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Electrical World

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Electrical World

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Facts Replace Guesswork in the Business

A BROAD movement of fundamental importance has been started by the manufacturers and distributors of electrical goods. Accounting, cost-keeping and business methods are being scrutinized by competent committees of several associations in order that their respective members—contractors, manufacturers, jobbers and dealers—may arrive at a common understanding of what constitutes the cost of doing business in manufacturing, in jobbing and in retailing electrical goods. The manufacturers, by having a common knowledge of what items enter into overhead and how these should be distributed over factory costs, will compete on an intelligent basis of facts instead of on guesswork. The jobbers, with a more definite knowledge of the cost of handling different lines of apparatus, merchandise and supplies, can determine which are profit and which are non-profit lines. The dealer and contractor and the merchandise departments of the central stations will each fix his prices to the public on a basis of knowing what the cost of doing business is. This work cannot fail to help the industry meet competitive situations within the trade on an intelligent basis and, as Mr. Debevoise points out in an article in this number, a new basis of universal understanding and action will result. The work goes further. Competition will soon be international as well as national. Unless our industries are prepared with the facts on costs, no intelligent help can be given by tariff commissions or other governmental bodies. Chairman Hurley of the Federal Trade Commission has already pointed out that the business men of this country must meet the situation with facts on costs instead of guesswork. The constructive program of the organized associations of the industry indicates that the electrical business is well advanced and fully alive to the importance of the situation.

Regulating Things as They Are

THE concurring opinion of Commissioner Walter A. Shaw recommending the consolidation of the Illinois Northern Utilities Company, the Tri-County Light & Power Company and the Freeport Railway & Light Company, describes the prevalent facts and throws an interesting light upon the issuance of stock for purposes of consolidation under the Illinois law. By stipulating the conditions to be printed upon the stock of the consolidated company, the commission advises the public as fully as possible that an approval by the commission of securities of any character, is not a guarantee on the part of the state, either as to the value of the tangible property or as to the rate of return or success of the utility management. It, however, insists that the public must employ the same business judgment in buying public utility securities that it exercises in dealing with any other class of securities covering a different character of business. Of course it would be a very unfortunate condition of affairs should the public ever believe that an approval of securities by any governmental agency carries with it or implies a broad guarantee of future earnings. The commission takes a sane view of securities previously issued. It can see no benefit in making a valuation for the purpose of limiting the amount of outstanding stock of a consolidated company, inasmuch as it does not feel called upon to concern itself with past issues for the purpose of correcting the evils of former years. The theory is expressed, that should the commission adopt the policy of entering upon valuations whenever security issues are involved, it would result in a general financial upheaval of the public utilities of the state. On the other hand, the commission is determined that new security issues of existing utilities must represent actual property, dollar for dollar. This is as it should be. The past history of many utilities is as incomplete and as unsavory sometimes as the past history of many individuals and of nations. Previous baseness or greatness is no criterion of the present condition. Much that was permissible in the past would not be tolerated to-day, and if public service commissions would concern themselves more with the present than with the past, regulation would be farther advanced and more satisfactory to the public and to the utilities alike.

The Losses Which Progress Brings

ADVANCE in the electrical art is the responsible cause of the question whether the costs of superseded equipment shall remain in the capitalization of a utility company. If progress had only been content with the initial developments in electrical apparatus, this troublesome problem would not have arisen. But the instinct for achievement and perfection inspires the efforts which lead to ever increasing efficiency. Apparatus is scrapped to be succeeded by newer and more economical types, which also give way in turn to the more efficient products of the tireless inventor and enterprising manufacturer. No one can safely say that even the giant turbines of to-day will not succumb, sooner or later, before super-turbines of to-morrow. It is this hazard of the past and speculation of the coming years which make the problems involved of grave importance. The discussion by Mr. Dreyfus elsewhere in this issue centers attention on the issue of capitalization.

Whether our public be one of newspaper readers, buyers of general merchandise or of a service, every purveyor asks first what his public would like to have and then he sets about providing it in the best way that he knows. In the case of the electrical utility the public demands, and the well managed company seeks to give, a high grade, uninterrupted service. The best possible service is none too good, the lowest practicable rate is none too low. Then the question arises: Is the public willing to pay the price? And the corollary to this is: How shall the cost best be met in a manner fair both to buyer and seller? It is clear that the cost of equipment which is reasonably superseded because of advance in the art has to be amortized from earnings or retained in capitalization or provided for by a combination of both practices. If it is wiped out by charges against profits or surplus the rates must have been high enough to permit that policy to be followed. If it is to be kept permanently or for an agreed number of years in the capitalization, this method should be recognized as just and the rate making and financial management of the company conducted in conformity with this program. Necessarily, public approval should follow.

The interests of public and utility on this point touch so closely that they are capable of intimate union. The public can fairly ask high quality of service and the lowest rate consistent with protection of the investment and an adequate return. That is precisely what the utility stands ready to give, though it must be assured of a return that will unfailingly attract new capital. By making every effort to avoid disastrous errors in the calculation of its requirements and to prevent waste in management and in purchase, the utility will co-operate to establish this arrangement on a successful, enduring basis.

Effect of High Continuous Voltages on Insulation

THE paper by F. W. Peek read at the recent Cleveland A.I.E.E. convention is a valuable contribution to the literature of high-voltage tests. It has only recently been possible to obtain, for such tests, a regulable convenient source of direct-current high voltage through the use of the kenotron. The tests indicate that when a spark gap is used in ordinary air the maximum sparkover voltage is the same for either alternating or direct-current application, provided that corona is not first produced. The visible corona also makes its appearance at very nearly the same voltage in either case. After corona has occurred the direct-current breakdown voltage exceeds the alternating-current breakdown voltage.

Liquids and gases appear to behave so nearly alike to maximum alternating-current and direct-current voltages, that their most interesting relations are comparative deviations. Thus, moisture-bearing oil showed a lesser direct-current rupturing voltage, possibly owing to electrolytic actions. Solids appear to behave differently to maximum direct-current and alternating-current voltages. This is reasonable, because insulating solids commonly possess pores, or minute crevices, which tend to fill up with either moisture or gas. Such veins of heterogenous material, even if non-conducting to direct-current potential gradients, become partially conducting, and also have a distorting influence, with alternating-current potential gradients. Consequently, the alternating-current stresses are always likely to be greater than the direct-current stresses. It is not surprising, therefore, that the breakdown strength of solids should be found distinctly less with alternating-current than with direct-current voltages. In the case of moisture-holding paper cables, however, which might virtually be regarded as faulty, the alternating-current and direct-current voltages were nearly alike. This suggests that a direct-current high-voltage testing equipment is well adapted for testing lengths of freshly manufactured cable. Such an equipment is relatively portable and easily applied. If the cable is without flaws, it can stand a given maximum direct-current testing voltage without injury. If moisture faults exist, it may be expected to break down as readily under direct-current as under alternating-current maximum voltage. It may, moreover, even be possible, some day, to convert high-tension alternating-current to direct-current voltage, and back, merely to lessen the dielectric stresses on the distributing cables.

For several years Mr. Peek has contributed valuable papers on high-tension phenomena to A.I.E.E. conventions, and we hope to see this also "continued in our next." It is the steady prosecution of researches in a laboratory, where the instruments, apparatus and observers all become trained, that counts in the long run.

Electrical Manufacturers for 1914

THE census figures for electrical manufacturers for 1914 show an increase of approximately 50 per cent over the previous census figures of 1909. Considering that the year 1914 was one of great business depression from which the industry has since fully recovered, the showing while not out of the ordinary, is comforting. Had the census been taken for 1913 the percentage increase would have been easily doubled. Although the number of establishments was less than in 1909 by 2.6 per cent, the number of manufacturers engaged primarily in the electrical manufacturing business increased by 21 per cent. It is interesting to note that one-half of the $359,000,000 represents the output of three companies, the General Electric Company, the Western Electric Company and the Westinghouse Electric & Manufacturing Company. The aggregate sales of these three companies in 1914 was $188,000,000 and although some of this, in the case of the General Electric and Westinghouse companies, represents steam equipment and, in the case of the Western Electric Company, sales of other manufacturing companies, the amount is not sufficient to destroy the ratio. The manufacture of insulated wire and cable still exceeds in importance the manufacture of any other electrical commodity. The value of the product is more than double that of any

other line except motors. The changes in the art during the five-year period covered are at once apparent in the statistics. Carbon-filament incandescent lamps decreased in value 77.3 per cent while tungsten-filament lamps increased 90.5 per cent. The increase in the value of storage batteries of 150 per cent may be attributed to the wide use which small storage batteries have found as part of the lighting and ignition equipment of gasoline automobiles. The value of the output of dry cells shows a very healthy increase and reflects the great use of these in flash lamps and other equipment. The extent to which the tungsten lamp with its higher efficiency and longer life, has affected the central station companies as well as the manufacturers is shown in the statistics for incandescent lamps. The 10 per cent increase over a five-year period does not mean that the lamp business has reached the saturation point nor does it reflect the amount of new business connected to the lines of central station. Central station income from lighting shows a constant increase year after year, because central stations are securing more customers to offset the loss in income due to the increased efficiency of the tungsten lamp and because the consumers are also using more light. Incidentally, the census figures disprove the assertion made in the Merrill water-power report of great increase in hydroelectrical development during the five-year period. According to the census figures there was a decrease of over 13 per cent in the number of alternators installed and a decrease of 11 per cent in their value in 1914 compared with 1909.

Difficulties in Trans-Atlantic Radio

ON June 27, and again on July 25, the wire telegraph companies which collect messages for transmission to Germany via the powerful wireless stations at Sayville, L. I., and Tuckerton, N. J., refused to accept additional dispatches for those radio routes. In each case it was stated that messages had accumulated faster than they could be sent out, and in the earlier instance the reason for this was said to be not to an abnormally rapid rate of filing messages, but due, to a decrease in the possible rate of transmission. The slower net speed of sending was the result of many enforced repetitions, and the repetitions were occasioned by atmospheric disturbances.

This matter of atmospheric interference with the transmission of messages is the only great problem of long-distance radio-telegraphy which remains unsolved to-day. The earlier difficulties, such as securing reliable and efficient generating plants for transmitting stations and devising sensitive yet dependable and selective receiving apparatus, have been solved nearly if not quite to the satisfaction of engineers working in the field. But discrimination between signal-waves, which it is desired to have recorded at the receiving station, and stray or parasitic waves due to natural electrical disturbances, whose effects must be suppressed, has not been entirely successful.

It is true that radio-telegraphers to-day are able to signal far greater distances without severe interference from "static," as the natural disturbance is often called, than in previous years. This is partly the result of using larger powered transmitters, but mainly depends upon the development of several effective atmospheric-reducing methods. The two greatest advances along these lines came with the introduction of musical sparks and with the adoption of continuous waves in combination with receivers of electrical beats. Both of these take advantage of the few inherent differences which exist between signals and stray atmospheric waves.

The difficulty of "static" elimination resides in the similarity of the effects produced on a receiver by the desired and by the parasitic waves. Each is an electromagnetic disturbance in the ether, and each sets up radio frequency current in any receiving aerial upon which it strikes. The order of the frequency, and (in spark telegraphy) of the damping or amplitude decay, is the same in both. The intensity of the interfering current may be thousands of times greater than that of the desired signal, and manifestly it is not easy to secure a constant response to the weaker wave.

It is fortunate that the stray waves occur irregularly, and that, as a result, they produce the scratchy, hissing sounds characteristic of irregular disturbances. By emitting the signal waves in regular, well-timed groups it is possible to secure Morse signals as clear, musical tones at the receiver, thus a distinction in sound can be made by the receiving operator. When this musical signal response is combined with the transmission of sustained or continuously-generated streams of waves, the selection is further facilitated. By this latter plan the harmful effects have been so far reduced that it is now entirely feasible to signal over the 4000 miles between New York and Germany at all times except under the conditions of worst disturbances.

The Coming Issues

THE operation of the special prime movers and control equipment in the world's largest direct-current plant, the 65,000-kw. station of the Ford Motor Company of Detroit, will be a feature of the station-operating number of the ELECTRICAL WORLD for next week, issued under date of Aug. 12. Another article in the same number will point out methods for reducing costs in the steam-generating ends of electric power plants, and a graphical method of calculating the characteristics of electric transmission lines will also be presented. In the engineering or third issue of the month, an account will be given of an investigation of feeder arrangements and disposition of copper in an Edison three-wire distribution system. Another article in this Aug. 19 engineering number will present a study of the strength of copper splices in overhead lines. The fourth issue of the ELECTRICAL WORLD for August will contain articles and features on commercial practice with special reference to the opening of the fall season. The second number of ELECTRICAL MERCHANDISING, the new monthly magazine which extends to the electrical trade the editorial service of the ELECTRICAL WORLD organization, will be issued Aug. 15.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

CONVENTION OF EDISON SALES MANAGERS

The Sale of Lamps, Wiring of Houses and Industrial Loads Discussed at Three-Day Association Island Meeting

The annual convention of the sales managers of Edison electric illuminating companies was held at Association Island, Henderson Harbor, N. Y., July 31, Aug. 1 and 2, under the presidency of Joseph D. Israel of the Philadelphia Electric Company. Those in attendance included representatives of the sales departments of the New York Edison Company, the Edison Electric Illuminating Company of Brooklyn, the Edison Electric Illuminating Company of Boston, the Philadelphia Electric Company, Public Service Electric Company of Newark, United Electric Light & Power Company of New York, the Consolidated Gas, Electric Light & Power Company of Baltimore, Potomac Electric Power Company of Washington, Commonwealth Edison Company of Chicago, Cleveland Electric Illuminating Company, Detroit Edison Company, Union Electric Light & Power Company of St. Louis, New York & Queens Electric Light & Power Company of Long Island City, and the Public Service Company of Northern Illinois.

The papers read and discussed were as follows:

"A Report on Mechanical Indicating Device Making for Good Service in the Customers' Room of a Public Service Company," by Mathias Turner, Cleveland, Ohio. "A Report System that Reduced Salesmen's Petty Expense 50 Per Cent," by Mathias Turner, Cleveland, Ohio.; "A Report on Financing and Collecting Installment Accounts of Wiring Contractors and Supply Dealers by the Banks," by Mathias Turner, Cleveland, Ohio; "Merchandising Electric Lamps," by E. A. Edkins, Chicago, Ill.; "Lamp Prices and Practices," by T. I. Jones and M. S. Seelman, Jr., Brooklyn, N. Y.; "Printed Instructions for Salesmen," by R. S. Hale, Boston, Mass.; "Electric Steel Making," by E. L. Crosby, Detroit, Mich.; "The Development of Electric Enameling Ovens," by C. F. Hirshfeld and W. D. Dygert, Detroit, Mich.; "Results of a Census Campaign," by L. R. Wallis, Boston, Mass.; "Results and Facts on Wire Your Home Month," by D. V. Smith, New York, N. Y.; "Wiring Old Houses," by F. D. Beardslee, St. Louis, Mo.; "Experiences on the Use of One Meter to a Contract," by A. A. Pope, New York, N. Y.; "The Handling of Large Industrial Installations," by R. H. Tillman, Baltimore, Md.; "Relation of Efficient Factory Production and Power Sales," by H. H. Holding, Newark, N. J.

General Electric Company Divides Profits with Employees

Nearly 9000 employees of the General Electric Company's plant in Schenectady received Tuesday their first extra payments as a result of the most successful year in the company's history. Similar distributions will be made to long service employees in other localities, so that about $550,000 was distributed among 19,000 employees. The second extra payment to be made next February will probably be somewhat larger in total.

Commercial Section of the N. E. L. A. Maps Out Its Work

The executive committee of the commercial section of the National Electric Light Association met at Association Island, New York, on Saturday, July 29. All but two of the committee were present. Chairman Edkins reviewed briefly the work of last year in opening the meeting and said that great inspiration should be derived from the work of Mr. Becker's administration. He emphasized especially the correspondence course on the education of salesmen and the work of the publication committee.

Appointments were made to the following standing committee: Finance, publications, salesman's hand book, power sales bureau, lighting bureau, industrial heating, wiring, merchandising and education of salesmen. In connection with the latter committee some discussion was had on a number of further courses which may be started this year. One of these will deal with magnetism and electricity while others will treat of appliances, illumination, industrial heating, electric power, commercial management and merchandising.

On the recommendation of Mr. Putnam of Salt Lake City, who was chairman of the electric range committee last year, it was decided to appoint on the range committee this year more eastern members. A new committee dealing with commercial service and relations with customers was announced.

Chairman Edkins expects to outline a definite program of the commercial section to President Wagner within three weeks and for that purpose has requested the chairmen of the various committees to place at his disposal a tentative outline of the year's work. An exchange of advertising material is being arranged for to enable the publicity departments of the various companies to profit by the experience of other companies.

Legislation Affecting Niagara Falls Planned

Hearings begun four years ago by the House Foreign Affairs Committee on legislation to regulate diversion of water at Niagara Falls for generation of electricity were closed Tuesday. Before Congress adjourns the committee plans to report a bill based on that introduced by Representative Cline of Indiana for co-operation with Canada in preserving the scenic beauty of the Falls and at the same time developing their hydroelectric resources. Indications are that a joint international commission to limit the diversion of water will be recommended.

Final statements supporting the claim of New York State to make use of the water diverted were presented by a committee of the New York State Legislature, consisting of State Senators George C. Thompson and George W. Simpson and Assemblyman Joseph D. Kelly. They took the position that the federal government may control the amount of water which shall be diverted, but that its use should be granted to the state for development with any accruing revenue. They also suggested that the boundary waterways treaty with Canada be enlarged to develop power projects all along the border.

ILLINOIS WATER-POWER SITE CHANGES HANDS

Saiitary District of Chicago Secures Control of Joliet Dam Formerly Leased to the Economy Light & Power Company

Control of a dam and power site at Jackson Street, Joliet, Ind., which has been developing about 3000 kw. and which for sixty years has been held by the Economy Light & Power Company, now a subsidiary of the Public Service Company of Northern Illinois, is to be transferred to the Sanitary District of Chicago. Sixty years ago the Illinois & Michigan Canal Commission granted the Economy Light & Power Company a twenty-year lease on the power site, with provisions for two twenty-year renewal periods, for which rights the Economy company paid the State approximately $9,500 yearly. The last of the renewal periods expired July 17.

At that time Governor Dunne decided that the lease was not again renewable, and so called for bids on the site. When the bids were opened on July 15 Andrew J. Cook was the sole bidder, offering $1.50 per horsepower year for the site. Just at that time the situation was somewhat clouded by a movement at Washington, D. C., to restrict the flow of water to 25,000 cu. ft. per second in the channel of the drainage canal. This possible water restriction had prevented the Sanitary District from bidding, even in spite of the fact that it had invested $500,000 in a dam at the Economy power site in 1903 at the order of the State to preserve the navigable qualities of the Illinois & Michigan Canal.

The first lone bid of June 15 was rejected, and bids were asked again for July 17. Before that date the Sanitary District succeeded in defeating the movement to restrict the flow. When the second set of bids were opened it was found that Andrew J. Cook had bid $3 per horsepower-year and that the Sanitary District had presented two bids. These bids were made with the understanding that the leasor should put in machinery and develop 7000 hp. The first bid of the Sanitary District was a cash offer of $15.01 per horsepower-year for all power that could be developed. The second bid, known as alternative B, offered to immediately do $1,500,000 worth of work in constructing locks at Lockport and at Joliet as a step in a Lakes-to-Gulf waterway, and other work in the channels of the Desplaines River and the Illinois & Michigan Canal. In addition the Sanitary District was to pay $1 per horsepower for all power developed in excess of 7000 hp. at high-water stages and at any other times. The lease offered is to run for a twenty-year period. At the end of twenty years the plant and works will become the property of the State, except one-fifth of the property, which continues to be the property of the successful bidder.

The Governor of Illinois has rejected the bid of Mr. Cook, and as yet has not decided which of the bids of the Sanitary District he will accept. His decision hinges on considerations which have to do with the plans for a Lakes-to-Gulf waterway. The site would be valuable to the Sanitary District.

It is understood that the bid offered by Andrew J. Cook was made for the Public Service Company of Northern Illinois. The reasons why the site was not considered more valuable by this company are: that the site does not fit in with the company's general plan of using large generating stations with its transmission and distribution systems; that energy can be made in its steam station with an ultimate rating of 60,000 kw. now under construction near Joliet almost as economically as in waterwheel units, and that the water-power plant lying in the center of the city as it does presents formidable difficulties in high-tension line construction to it.

NIAGARA HYDROELECTRIC SITUATION DISCUSSED

New York State Legislative Committee Hears Testimony of Electrochemists and Will Recommend Legislation

Aroused by the apparent neglect on the part of the government to foster the development of Niagara Falls electrochemical industries, members of the joint legislative committee of New York State of which Senator George F. Thompson is chairman, are advocating a bill which would give the state absolute control of diversion for electrical development. The joint state committee held a series of hearings at Niagara Falls, N. Y., last week, and much important evidence was adduced which showed the urgent necessity of greater diversion for power development.

Representatives of many large Niagara Falls electrochemical industries told how they have been forced to establish branches at Niagara Falls, Ont., and in Norway, Germany, and other European countries because of the great shortage of power on the American side. Water power authorities who testified before the joint committee expressed the opinion that the scenic beauty would not be impaired by doubling or even tripling the water diversion.

Probably the most important witness before the committee was F. A. J. FitzGerald of Niagara Falls, N. Y., president of the American Electro-Chemical Society. Mr. FitzGerald urged immediate legislation to extend the diversion limit for power to 20,000 cubic feet a second, the maximum fixed by treaty. This would be an additional 4400 cubic feet per second, an amount capable of generating about 80,000 hp. While the additional power would meet present needs, Mr. FitzGerald said this would not meet prospective requirements.

ELECTROCHEMICAL GROWTH AT NIAGARA

Reviewing the history of electric development at Niagara Falls, Mr. FitzGerald said that when he came to the Cataract City in 1895, there was but one industry dependent upon electricity for its product. That was the Pittsburg Reduction Company, now the Aluminum Company of America. The Niagara Falls Power Company then had only three generators in operation. Now there are twenty, most of them vastly larger than the first units in operation. Yet, Mr. FitzGerald said, there is not sufficient power to meet the requirements of industrial establishments on the American side of the Niagara River. He told of the development of the aluminum industry and of the artificial abrasive industry and of other industries that have come as the result of cheap and abundant power.

"The Carborundum Company and the Norton Company both have branch plants in Germany," said Mr. FitzGerald, "and they are of the utmost importance to the German Empire in this world-war. Germany could scarcely get along without them. The Norwegians are receiving the aid of the government in the establishment of electrochemical industries in that country and no doubt the Germans have plants of that nature in Norway. It is possible to manufacture products in Norway and sell them in New York City as cheaply as those that are products of Niagara electrochemical industries. So the great importance of not forcing the shortage of Niagara products is apparent."

Mr. FitzGerald spoke on the importance of the nitrates and of the necessity in the United States of developing the fixation of atmospheric nitrogen. The American Cyanamid Company of Niagara Falls, Ont., has greatly enlarged its plant, he said, and all of the company's products of nitrates come to the United States as fertilizers. The speaker said that the United

States is dependent upon Chili for its nitrates and added that without nitrates no nation could defend itself with arms. Mr. FitzGerald declared that although the Canadian nitrate plant across the river is not producing nitric acid for the manufacture of munitions, there is a strong possibility that it will do so within the near future. Given plenty of power, Mr. FitzGerald said Niagara Falls electrochemists could by developing the fixation of atmospheric nitrogen make the United States absolutely independent in the matter of nitrates.

"I have investigated the possibilities of establishing a large electrochemical industry in the State of Utah, where power is abundant, but despite this consideration, I found it would cost more to market the product manufactured there than if it was manufactured in Norway," said Mr. FitzGerald.

Among others who appeared before the joint state committee were Dr. E. G. Acheson of the Acheson Graphite Company; Frank J. Tone of the Carborundum Company; W. A. Jamieson of the William A. Rogers Company; W. L. Bliss of the United States Heat & Light Corporation; Max Mauran of the Castner Electrolytic Alkali Company; H. G. Akers of Toronto; M. Arnson, vice-president of the Hydro-Electric Association; Peter A. Porter, James S. Simmons and others who have taken an active interest in the campaign for greater development of water power.

The first intimation that the power situation has become so acute was given by Dr. E. G. Acheson of the Acheson Graphite Company. Dr. Acheson said his company has contracted for 9000 hp. to be generated at the new steam generating plant of the Buffalo General Electric Company, of Buffalo, N. Y. Additional power will make it possible for the Acheson Graphite Company to double the capacity of its plant.

Need of More Power Shown

Frank J. Tone of the Carborundum Company, said that the inability of American manufacturers to obtain power was forcing American industry to Canada and European countries. He said that not only the Carborundum Company but other Niagara Falls industries have established large branches on the Canadian side of the river and that one branch has been established in Germany. He said that his company uses 10,000 hp. and needed that much more, but is unable to get it. Other Falls industries face the same situation.

"Doubling and even tripling the diversion of water at Niagara Falls for power development would not impair the scenic beauty of the cataract," said W. A. Jamieson of the William A. Rogers Company, a large silver-plating establishment. "We want to double our capacity but owing to the great shortage of power we are operating far below our maximum. If we used steam generated electricity rather than Niagara power the cost of producing our products would increase 225 per cent."

Former Representative Peter A. Porter told of the Junior Niagara plan of power development which has been submitted to the Canadian government for investigation and approval. This plan calls for the construction of a dam in the lower gorge for the purpose of generating 2,000,000 hp. James S. Simmons, former representative from Niagara Falls, also told of plans of the Lower Niagara River Power Company.

W. L. Bliss of the United States Heat & Light Corporation told the committee that while his company was not one of the large users of Niagara power, taking only 1000 hp., the cutting off of the supply of cheap power would put one branch of the company's business out of existence. He declared that without cheap Niagara power it would be impossible to operate the storage battery department, one of the most important phases of the firm's activities. He said his company has been fortunate in obtaining an additional 1000 hp. and with this additional power the company will increase its working force to more than 2000 men.

Unable to obtain additional electric power, Max Mauran of the Castner Electrolytic Alkali Company told the committee his company's operations are being greatly curtailed. The industry is now utilizing 10,000 hp. and another block of the same size could easily be used.

Officers of the Hydro-Electric Association of Niagara Falls, who appeared before the committee, advocated state development of power at Niagara Falls. They told of the plan of the submerged power station underneath the American Prospect Park costing upward of $5,000,000. The association also advocated the creation of a Hydro-Electric Commission similar to the Ontario body, but Senator Thompson said he did not believe the time was propitious for state development.

H. G. Akers of Toronto, Ont., an electrical engineer associated with the Ontario Hydro-Electric Commission, attended the hearing, simply to obtain information as to the demands of American industries as regards future power developments. Mr. Akers expressed himself in favor of a joint conference between representatives of the United States and Canada for a new international treaty regarding water diversion for power purposes and said the two countries could develop all the power of the Niagara and St. Lawrence rivers that could be made available for use and said that the Ontario commission is desirious of bringing about such a joint conference.

At the close of the hearings Chairman Thompson said that a bill will be introduced in Congress which would give New York State absolute control of water diversion for electrical development.

Street Lighting Rate Cut by Commission

The Milwaukee Light, Heat & Traction Company will have to reduce its rates for emergency street lights from $47.40 per lamp per year to $40 a year.

The Wisconsin Railroad Commission issued an order last week requiring the company to make the reduction within thirty days. The company must also turn the lights on and off.

"The action of the commission completely sustains the city's lighting engineers, Vaughn, Meyer & Sweet," said Commissioner Simmons. "The city's experts held that a rate of $38 per lamp would be justified. With the requirement that the company must turn the lights on and off, the commission's figure approximates this rate."

The city will save between $700 and $800 by the commission's decision, there being about 100 emergency lamps in operation. The city brought action against the company to reduce its rate last December.

Permit Issued for Los Angeles Municipal Substation

On July 27 the city of Los Angeles issued a building permit for a $50,000 municipal substation to be erected on St. John Street in the northern part of the city. This station will step down the 100,000-volt current from the transmission line, nearing completion, from plant No. 1 in San Francisquito canyon, and will distribute it to local distributing stations. Two municipal distributing stations are now being built in the city, one in the Hollywood district and one in the Garvanza district.

PORTABLE MACHINE SHOP FOR U. S. ARMY

Gasoline Driven Generator Supplies Energy to Motor Operated Machine Tools Carried on Motor Truck—Outfit Similar to That Used on Continental Battlefield

The portable machine shop shown in the accompanying illustrations, which is similar in every respect to the ones now in use on the continental battlefields, has recently been completed for the United States Army. This motor truck carries a complete electric generating outfit which operates the motors that drive the machine tools and also lights the shop. The generating unit with its switchboard is shown in Fig. 2. It consists of a 10.5-hp., four-cylinder gasoline engine direct connected to a 5-kw., 110-volt, direct-current generator, which operates at 1200 r.p.m. The engine is water-cooled and supplied with fuel from a tank carried beneath the floor of the truck. The radiator and fan for the engine can be seen in the background of Fig. 2.

The armature core of the generator is of the iron-clad, slotted drum type, with ventilating spacers to insure good air circulation. The armature coils are made of a single length of bar copper of the shortest possible length to decrease copper losses. These coils are interchangeable, allowing repairs to be made very quickly. The armature is banded with phosphor-bronze wire, impregnated and baked. Other details of the generator are of rugged design to insure good wearing qualities. Additional ventilation is furnished by a ventilator back of the armature which is constructed so as to assist the natural circulation. The net weight of the generator is 500 lb. The complete motor-generator set weighs 900 lb.

The switchboard is enameled slate and carries a 250-volt, direct-current voltmeter, a 75-amp. ammeter, two 75-amp. circuit breakers, a field rheostat and the usual switches and lights. The ignition batteries of the truck are charged through resistance, controlled by separate switches. The wiring from the board to the various machines and lights is carried in rigid steel conduit. Outlets are provided for five ceiling lights for machines, two for extra lights and one for the portable electric drill.

The lathe, drill press and bench grinder are each

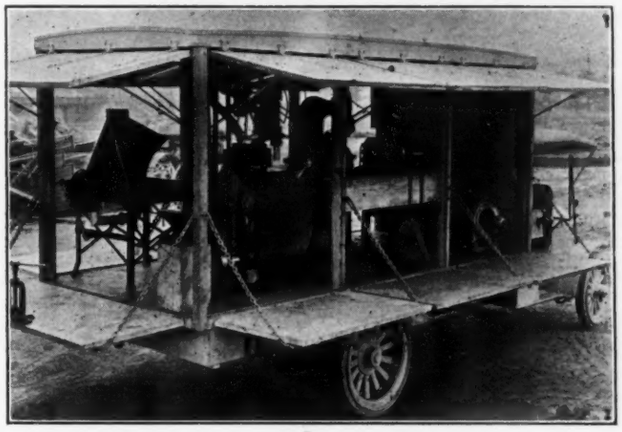


FIG. 1—UNITED STATES ARMY MOTOR TRUCK WHICH CARRIES MOTOR DRIVEN MACHINE TOOLS

operated by a 1.0-hp., 110-volt motor. The lathe has a 13-in. swing and a 60-in. bed. The 20-in. drill press is arranged with back gears and power feed. In addition to this equipment the truck carries a forge, anvil, arbor presses, work bench, vises and a complete assortment of machinists' and blacksmiths' tools. Over 250 items are included in the equipment, among the interesting features of which are an electric vulcanizing apparatus and a complete oxy-acetylene welding set for making quick repairs in iron work.

The motor truck chassis is a standard 3-ton, heavy-

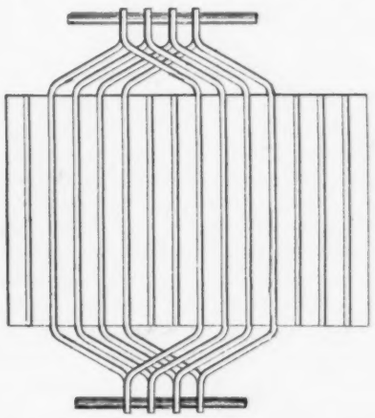
FIG. 2—THE 5-KW. ENGINE DRIVEN GENERATOR WHICH SUPPLIES ENERGY TO THE MOTORS AND LAMPS

duty design made by the Peerless Motor Car Company of Cleveland, Ohio. It has a British army type of driver's seat suitable for four men, and is equipped with a varied assortment of motor accessories. A special substantial body is provided which has sectional sides that lower to the plane of the truck floor and raise to the level of the roof, as may be seen in an accompanying illustration. Cabinets for storing small tools and supplies are built into the front end of the body.

The entire equipment is compactly arranged and can be entirely enclosed by means of hinged shutters on the sides and rear as shown in Fig. 1.

A High Speed Squirrel Cage Winding

In an induction motor winding patent, No. 1,191,209, issued to the Westinghouse Electric & Manufacturing Company, Frederick S. Martin proposes splitting copper strips so as to form loops which, when expanded to embrace the requisite number of slots, can be intercon-



INDUCTION MOTOR WINDING

nected at the unsplit portions so as to form a short-circuited winding. The slotted strips have notches at their ends into which short-circuiting end rings are sprung. The whole forms thereby a squirrel cage winding which will very easily withstand high speed operating conditions.

Census of Electrical Machinery, Apparatus and Supplies

Statistics Gathered by Department of Commerce for 1914 Shows Output of $359,412,676, an Increase of 50 Per Cent Over 1909—Batteries and Heating Apparatus Show Great Gains

A SUMMARY of the general results of the 1914 census of manufactures with respect to the electrical-machinery industry has been issued by Director Sam L. Rogers of the Bureau of the Census, Department of Commerce. It consists of a statement of the quantities and values of the products manufactured, prepared under the direction of William M. Steuart, chief statistician for manufactures. The figures are preliminary and are subject to such change and correction as may become necessary upon further examination of the original reports.

The statistics for 1914 cover a period of depression due to the outbreak of the European war, from which the industry has since fully recovered.

ESTABLISHMENTS REPORTED AND VALUE OF PRODUCTS

Reports were received from 1121 establishments engaged in this industry in 1914, with products valued at $359,412,676. Of these establishments, the principal business of 1030 was the manufacture of electrical machinery, apparatus, and supplies, and ninety-one, which were engaged primarily in other lines of manufacture, produced electrical machinery and apparatus to the value of $24,261,961.

At the census of 1909 there were reported 1151 establishments, with products valued at $240,037,479. Of these, 1009 were engaged primarily in the manufacture of electrical machinery, apparatus, and the supplies, and 142 manufactured such commodities to the value of $18,728,916 as subsidiary products.

Although the total number of establishments reported in 1914 was smaller by thirty than the corresponding number in 1909, the number of establishments engaged primarily in this industry increased by twenty-one and the total value of products exceeded that in 1909 by $119,375,197, or 49.7 per cent.

It is to be noted that these statistics do not cover porcelain electrical supplies, manufactured by the clay-working industries—valued at $4,130,270 in 1914, as reported by the Geological Survey—nor globes and battery jars, manufactured in glass works.

DYNAMOS AND TRANSFORMERS

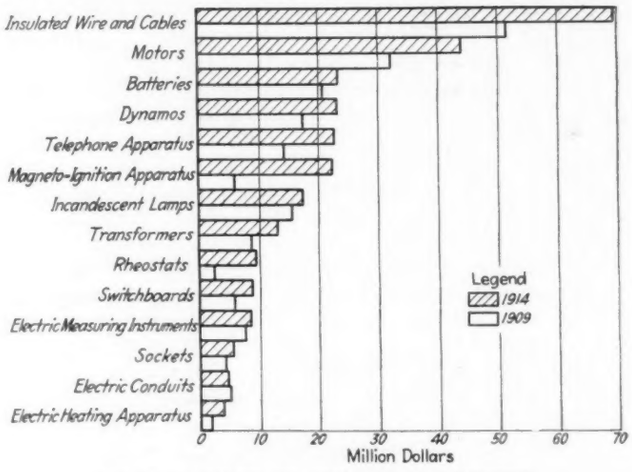
The output of dynamos, including parts and supplies, in 1914 was valued at $23,233,437, representing an increase of $6,001,633, or 34.8 per cent over the corresponding value for 1909. Under this head are included dynamotors, motor-generators, boosters, rotary converters, double-current generators, etc., 8393 in number, with an aggregate capacity of 780,009 kw. and valued at $5,367,895, representing increases of 266.3 per cent in number, 164.3 per cent in capacity, and 70.2 per cent in value, as compared with the 1909 figures.

Under the head of direct-current dynamos there were reported 208,548 small dynamos and automobile starter-generator sets, valued at $5,933,273, but this is not to be taken as the total output of such devices, since it is apparent that they were reported by the manufacturers in some cases with "motors for automobiles," and in other cases with unclassified electrical machinery.

The transformers manufactured in 1914 aggregated 115,843 in number, with 2,644,794 kw. capacity, and were valued at $13,120,065. The increase as compared with 1909 amounted to 51 per cent in number, 61.7 per cent in capacity, and 49.1 per cent in value. The 1914 total comprised 110,177 machines of less than 50-kw. capacity, valued at $7,316,615; 4857 of from 50 to 500-kw. capacity, valued at $2,625,414; and 809 of 500-kw. and over valued at $3,178,036.

MOTORS

The 1914 output of motors, including parts and supplies, was valued at $44,176,235, representing an increase of $12,088,753, or 37.7 per cent over the corresponding figure for 1909. Motors made in 1914 for industrial power and for railway use numbered 417,992, had an aggregate capacity of 2,882,795 hp., and were valued at $32,286,149. The percentages of increase in number, horsepower and value as compared with 1909 were 62.5, 19.6 and 31.2 respectively. Of motors for automobiles, 11,880, having an aggregate horsepower of 36,858 and valued at $1,351,442, were produced in 1914.



RELATIVE VALUE OF ELECTRICAL PRODUCTS

MISCELLANEOUS PRODUCTS

Other products reported for 1914 were: Light and power switchboards, panel boards, and cut-out cabinets, valued at $8,989,111, representing an increase of 50.5 per cent over the corresponding value for 1909; batteries, storage and primary, and parts and supplies, $23,402,455, an increase of 120.5 per cent; incandescent lamps, $17,350,385, an increase of 10.4 per cent; arc lamps, searchlights, projectors, and focusing lamps, $2,823,687, an increase of 6.8 per cent; telephones, telephone switchboards, and parts and supplies, $22,815,640, an increase of 60 per cent; telegraph apparatus, including wireless, switchboards, and parts and supplies, $2,248,375, an increase of 14.9 per cent; electric heating apparatus, including air heaters, cooking devices, flat-irons, and welding apparatus, $4,034,436, an increase of 106.5 per cent; electric measuring instruments, $8,786,506, an increase of 12.6 per cent; electrical therapeutic apparatus, $2,653,098, an increase of 139.5 per cent; insulated wires and cables, $69,505,573, an increase of 34.6 per cent; electric conduits, underground and interior, $4,874,709, a decrease of 4.4 per cent; magneto-ignition apparatus, spark plugs, coils, etc., $22,260,847, an increase of 265.4 per cent; electric

switches, signals, and attachments, $6,393,551, an increase of 18.9 per cent; carbons for furnace, lighting, brushes, battery, etc., $3,602,741, an increase of 86.2 per cent; annunciators, $263,806, an increase of 12 per cent; electric clocks and time mechanisms, $410,774, an increase of 16.5 per cent; and various other kinds of electric equipment, including sockets, receptacles and bases, some electric lighting fixtures, lightning arresters, fuses, circuit fittings, and unclassified electric machinery, apparatus, and supplies, $44,907,658, an increase of 56.3 per cent. The last item includes electric locomotives, mine and railway, of which there were reported 900, valued at $3,720,914.

The value of all products not of an electrical character, including custom work and repairing, in 1914 was $23,623,244, representing an increase of 33 per cent as compared with 1909.

The comparative statistics for 1914 and 1909 are summarized in the table published above.

Of the 1121 establishments reported for 1914, over half were located in New York, Illinois and Ohio, the largest electrical manufacturing states.

ELECTRICAL MACHINERY, APPARATUS, AND SUPPLIES—COMPARATIVE STATISTICS: 1914 AND 1909

	1914[1]	1909[1]	Per Cent of Increase,[2] 1909-1914
Number of establishments	1,121	1,151	− 2.6
PRODUCTS			
Total value	$359,412,676	$240,037,479	49.7
Dynamos, value	$23,233,437	$17,231,804	34.8
Direct current—			
Small dynamos and automobile starter-generator sets—			
Number	208,545		
Value	$5,933,273		
All other, including generators for direct connection to steam turbines—		13,882	.....
		414,222	.....
Number	9,633	$4,710,524	.....
Kilowatt capacity	221,221		
Value	$2,967,465		
Alternating current, including generators for direct connection to steam turbines—			
Number	2,512	2,909	−13.6
Kilowatt capacity	1,188,005	991,728	19.8
Value	$7,437,445	$8,370,524	−11.1
Dynamotors, motor-generators, boosters, rotary converters, double-current generators, etc.—			
Number	8,393	2,291	266.3
Kilowatt capacity	780,009	295,079	164.3
Value	$5,367,895	$3,154,733	70.2
Parts and supplies	$1,527,359	$996,023	53.3
Transformers, value	$13,120,065	$8,801,019	49.1
Under 50 kw.—			
Number	110,177	72,776	51.4
Kilowatt capacity	762,707	577,408	32.1
Value	$7,316,615	$4,184,832	74.8
50 to 500 kw.—			
Number	4,857		
Kilowatt capacity	544,443		
Value	$2,625,414	3,953	43.3
500 kw. and over—		1,058,021	77.9
Number	809	$4,616,187	25.7
Kilowatt capacity	1,337,644		
Value	$3,178,036		
Rheostats, resistances, controllers, motor-starting and speed-controlling devices, feeder-potential regulators, and reactances	$9,543,224	[3]$2,674,963	.....
Generator-voltage regulators	$245,154	[4]	.....
Rectifying apparatus (including rotating commutators, electric valves, mercury rectifiers, and vibrating commutators)	$147,965	[4]	.....
Switchboards, panel boards, and cutout cabinets for light and power	$8,989,111	$5,971,804	50.5
Motors, value	$44,176,235	$32,087,482	37.7
Direct current for industrial power and railways—			
Number	133,492		
Horsepower	980,820		
Value	$13,316,489	257,223	62.5
Alternating current for industrial power and railways—		2,410,369	19.6
Number	284,500	$24,604,938	31.2
Horsepower	1,901,975		
Value	$18,969,660		
For automobiles—[5]			
Number	11,880	2,796	.....
Horsepower	36,858	12,471	.....
Value	$1,351,442	$294,152	.....
For fans	$4,835,850	$2,450,739	97.3
For miscellaneous uses	$1,190,564	$1,942,874	−38.7
Motor parts and supplies	$4,512,230	$2,794,779	61.5
Batteries, parts, and supplies, value	$23,402,455	$10,612,470	120.5
Storage—			
Value of batteries	$10,615,150	$4,243,984	150.1
Weight of plates, pounds	41,079,047	23,119,331	77.7
Value of parts and supplies	$2,465,814	$434,225	467.9
Primary—			
Liquid and testing—			
Number	306,351	344,650	−11.1
Value	$802,525	$729,513	10.1
Dry—			
Number	71,092,438	33,988,881	109.2
Dry—			
Value	$8,719,164	$4,583,082	90.2
Value of parts and supplies	$799,802	$621,666	28.7
Carbons (including furnace, lighting, brushes, battery, and miscellaneous)	$3,602,741	$1,934,864	86.2
Arc lamps:			
With luminous or metallic arcs—			
Number...[6]	22,846		
Value	$441,992		
With flame arcs—			
Number	4,631	123,985	−71.7
Value	$153,433	$1,706,959	−56.5
With carbon arcs—			
Number	7,635		
Value	$146,717		
Searchlights, projectors, and focusing lamps	$2,081,545	$935,874	122.4
Incandescent lamps, value	$17,350,385	$15,714,809	10.4
Tungsten—			
Number	74,434,059	11,738,619	534.1
Value	$11,886,354	$6,241,133	90.5
Carbon filament—			
Number	14,092,055	55,038,378	−74.4
Value	$1,397,572	$6,157,066	−77.3
Gem, vacuum and vapor, nitrogen, glower and tantalum	$2,363,730	$2,715,991	−13.0
Decorative and miniature lamps, X-ray bulbs, vacuum tubes, etc	$1,702,729	$600,619	183.5
Sockets, receptacles, bases, etc	$5,512,609	$4,521,729	21.9
Electric lighting fixtures[6]	$3,383,955	$2,200,668	53.8
Telegraph apparatus, value	$2,248,375	$1,957,432	14.9
Intelligence (key, sounder, etc.)	$201,956	$197,669	2.2
Police, fire, district, etc	$1,253,954	$1,126,658	11.0
Wireless apparatus	$672,575	$448,262	50.0
Switchboards and telegraph parts and supplies	$119,890	$184,843	−35.1
Telephone apparatus, value	$22,815,640	$14,259,357	60.0
Substation instruments—			
Central battery, value	$3,916,869		
Magneto, value	$1,799,834		
Interior systems—			
Number	62,258		
Value	$510,509	$10,137,534	80.6
Central switchboards—			
Manual—			
Central battery, value	$10,701,764		
Magneto, value	$374,851		
Automatic	$1,002,722		
Private branch exchange switchboards—			
Number	3,693	2,252	64.0
Value	$448,203	$369,915	21.2
Parts and supplies	$4,060,888	$3,751,908	8.2
Electric heating apparatus, value	$4,034,436	$1,954,112	106.5
Air heaters, including those for cars	$352,617		
Cooking devices—		$919,533	155.7
Stoves and ranges	$671,413		
Miscellaneous cooking devices	$1,327,183		
Flat irons	$1,466,620	$951,074	54.2
Welding apparatus (not including the motor-generator set)	$216,603	$83,505	159.4
Electric measuring instruments, value	$8,786,506	$7,800,010	12.6
Station apparatus	$1,585,500	$1,639,202	− 3.3
Testing and scientific	$1,073,060	$546,970	96.2
Meters for consumers' circuits	$6,127,946	$5,613,838	9.2
Electric locomotives, mine and railway:			
Number	900	[4]	.....
Value	$3,720,914		
Electrical therapeutic apparatus	$2,653,098	$1,107,858	139.5
Magneto-ignition apparatus, sparks, coils, etc	$22,260,847	$6,092,343	265.4
Electric switches, signals, and attachments	$6,393,551	$5,377,843	18.9
Annunciators	$263,806	$235,567	12.0
Electric clocks and time mechanisms	$410,774	$352,513	16.5
Insulated wire and cables[7]	$69,505,573	$51,624,737	34.6
Electric conduits (underground and interior)	$4,874,709	$5,098,264	− 4.4
Lightning arresters	$1,188,773	$940,171	26.4
Fuses	$1,757,430	$1,001,719	75.4
Circuit fittings of all kinds	$2,067,683	$1,080,287	91.4
All other electrical machinery, apparatus and supplies	$27,276,294	$18,995,176	43.6
All other products, including amount received for custom work and repairing	$23,623,244	$17,765,645	33.0

[1]Includes, for 1914, number and output of ninety-one establishments engaged primarily in other lines of industry, but which manufactured electrical machinery, apparatus, and supplies valued at $24,261,961; and for 1909, number and output of 142 similar establishments which made electrical machinery, apparatus, and supplies to the value of $18,728,916.
[2]A minus sign (−) denotes decrease.
[3]Rheostats and resistances only.
[4]Figures not available.
[5]Includes a considerable number of starting motors for gasoline automobiles, not separately reported as such.
[6]Not including fixtures made by establishments engaged primarily in the manufacture of gas and electric fixtures.
[7]Including insulated wire made in wire-drawing mills.

Issuance of Stock for Purposes of Consolidation

Illinois Commission in Recent Merger Case Provides for Informing the Investing Public of the Conditions Under Which the Stock Is Issued by Means of a Recital Printed on Each Certificate

IN the matter of the application of Illinois Northern Utilities Company, Freeport Railway & Light Company and Tri-County Light & Power Company for the consent and approval of the State Public Utilities Commission of Illinois to the consolidation of said companies and for authority, in furtherance of said consolidation, to issue stock of the consolidated company, Commissioner Walter A. Shaw, the engineering member of the Illinois Commission, following the filing of a dissenting opinion on the part of Commissioners Funk and Yates, filed a concurring opinion, which throws extensive light upon the propriety of the issuance of securities in consolidations of public utilities.

The petitioners sought approval of a consolidation of three corporations engaged in furnishing electricity, gas, heat, and street car transportation in the northwestern portion of Illinois, and which have outstanding capital stock totaling $8,191,300, divided as follows:

1. Illinois Northern Utilities Company	$7,000,000
2. Tri-County Light & Power Co.	340,000
3. Freeport Railway & Light Company	851,300
Total	$8,191,300

In addition to the bonded indebtedness, which it is not proposed to change, the constituent companies have a floating indebtedness of $560,331.25, which under the plan of the consolidation is to be cancelled and extinguished, without the issuance of additional bonds or other liens upon the property and without drawing on the treasury of the companies.

The order of the commission authorizing the consolidation grants permission to issue $8,191,300 total capital stock of the consolidated corporation, provides for the cancellation of the floating indebtedness and prescribes that each certificate of stock of the consolidated corporation shall contain the following recital:

> "The Illinois Northern Utilities Company is a corporation formed by consolidation of the Illinois Northern Utilities Company, Tri-County Light & Power Company and Freeport Railway & Light Company, as authorized by the State Public Utilities Commission of Illinois, by its order of May 31, 1916, and the amount of stock by said order authorized to be issued on such consolidation was fixed at $8,191,300 (being an amount equal to the aggregate outstanding stock of the constituent corporations), without investigation by said commission of the value of the assets of said corporations."

Difference Between Reorganization and Consolidation

In explaining the difference between a reorganization and a consolidation, according to the Illinois Public Service Commission act, Mr. Shaw said:

"Relative to reorganizations of public utilities in this State, the Legislature has spoken quite definitely, and has decreed that the capitalization shall not exceed the fair value of the property involved in a reorganization; but relative to consolidations of public utilities, the Legislature has spoken definitely only in limiting the capitalization to an amount not exceeding the sum of the capital stock of the corporations consolidated. No doubt the Legislature foresaw that the conditions involved in a consolidation of utilities are far different from the conditions prevalent under a reorganization. A reorganization generally is the last chapter in a corporate history embracing a period of poor financing, faulty management, bad investments, unlucky operations, receivership and forced sale. Upon reorganization it is essential that some properly constituted administrative body should carefully scrutinize all the details by which it is purposed to place the defunct corporation on a proper financial basis, and it is quite natural that the best criterion for guidance in a reorganization is a valuation of the corporation's tangible property. In consolidations, however, the public itself is often the beneficiary, and the Legislature, in recognizing the many purposes for which consolidation may be legitimate, quite wisely refrained from making requirements to which it would be difficult to conform in effecting a consolidation. It is only fair to assume that, had the Legislature deemed it proper to require valuations to be made upon a consolidation of utility properties, it would have distinctly said so, and would not have left to this commission the determination of the rare cases wherein such a valuation may be necessary to protect the rights of the public. The Legislature, moreover, in stating the limit of the legal capitalization of consolidated utilities, undoubtedly had in mind that a capitalization of anything less than or equal to such a limit would be proper.

Public Should Benefit

"Before a consolidation is approved by this commission, it should appear that there is reasonable probability that the public depending upon the underlying companies will be benefited ultimately, and that the said consolidation reasonably may be expected to better service or to decrease rates. It does appear here that substantial savings in operating, general, and other expenses will result from the consolidation. It is also a fact that a floating debt, amounting to $560,331.25, will be retired at once. To liquidate this floating debt the underlying companies ordinarily would have the right, under the law, upon application to and approval by this commission, to issue either bonds or capital stock (or both), more probably bonds, for it is the experience of this commission that short-term obligations are ordinarily retired by the issuance of long-term interest-bearing bonds. In fact, the commission has already authorized the issuance of bonds to refund at least a part of this floating indebtedness, and this previous authority is revoked in granting consent to the consolidation. Were the underlying companies to exercise their undoubted right to issue such bonds in lieu of existing floating indebtedness (amount $560,331.25), the annual fixed charges of the said companies would be increased by from $25,000 to $30,000. These fixed charges, by reason of the consolidation, are eliminated, with obvious ultimate benefit to the companies' consumers in addition to material savings which may be made in operating, general, and other expenses.

Valuation Not Essential

"It is argued that before this consolidation is allowed and before new capital stock to the amount of the outstanding capital stocks of the underlying companies is permitted to be issued in replacement of the latter, a valuation should be required, and that the total securities authorized should not exceed the value determined. Neglecting for a moment the technical provisions of

Section 22, controlling consolidations, it is my opinion that, in this particular case, there is no benefit to be derived from a valuation of the segregated properties involved herein. Who is to be benefited by a limitation in the amount of outstanding stock of the consolidated company to the value of the property as appraised? Certainly not the present stockholders. The value of the present stock to its holders is determined largely by the annual net income therefrom, influenced to a certain degree by the character of management and by future prospects. Upon consolidation the income enjoyed by the several stockholders would not be affected by the amount of consolidated stock received in exchange for present stock. If perchance a stockholder should receive a lesser amount of consolidated stock in exchange for his former holdings, the rate of return on the consolidated stock would be increased proportionately. As a general proposition, the value of stock to the investing public is measured by the annual dividends which may be declared, or, in the absence of dividends, by the prospects which a company may have for the earning of dividends in the future. Who then will be benefited? If any one, I surmise it would be the innocent investor and purchaser of the future, for whose protection provision is now made in the commission's order by requiring that there be stamped upon the face of all stock certificates issued by the consolidated utility the recital before given.

Casting the Mantle of Charity Over Past Misdeeds

I do not believe that it is the intent of the law that this commission should undertake to correct all the evils that grow under past unregulated conditions, nor that this commission act retroactively, so to speak, by requiring valuations of all existing utility properties when allowing additional securities to cover additions, betterments, etc., in all cases where previously existing outstanding securities may exceed the value of the tangible property. Should the commission adopt a policy of entering upon valuations whenever security issues are involved, it is predicted that a general financial upheaval as far as the public utilities of the State of Illinois are concerned would result therefrom. In the final analysis the public would be the loser. I believe that the law as written intends that this commission should see that new security issues of existing utilities represent actual property, and that the law does not contemplate that this commission should concern itself with past issues for the purpose of correcting the evils of former years. This commission, in following the law as I believe it intends, by insisting that new securities be represented by property, in a reasonable length of time will secure an adjustment in the relation between outstanding securities compared with value of property.—Walter A. Shaw.

STAMPED STOCK AND THE INVESTOR

"This recital, in effect, advises all prospective purchasers that the stamped stock is issued as a result of a merger, that the total amount of consolidated stock is equal to the sum of the outstanding stocks of the underlying companies, and that no valuation has been determined by this commission. Therefore, ample notice regarding the conditions under which the stock has been issued is given to all prospective purchasers of the new stock of the consolidated company. In other words, the investor is advised fully that the new stock issue is no more valuable and has no more property behind it than the combined stocks of the underlying companies which it replaces. Conditions respecting the property, in which ownership is represented by the outstanding stock, are not changed by the act of the commission herein, and due notice of the essential facts is given to future purchasers. If anything, the investing public of the future is protected to a greater extent than formerly, for the reason that it is now advised by a recital in which the commission specifically calls attention to the fact that no valuation has been made of a property in which it (the investing public) is buying a shareholder's interest. Such a notice should tend to put a purchaser upon his guard, and to cause him to make the necessary investigation to satisfy himself as to the real value and future possibilities of the stock in which he contemplates investing his money.

COMMISSION DOES NOT GUARANTEE STOCK

"As to protecting the investing public, is it not reasonable to assume that anybody purchasing or contemplating the purchase of such property as is represented by the stocks of a public utility will exercise the same reasonable business judgment as would be expected of a person making other investments? If this commission, by its order, requires information to be printed upon the stock certificate and calls attention to pertinent facts under which the stock is allowed to be issued, has it not fulfilled its public duty in safeguarding the investing public? If, in the case at bar, it is to be contended that a valuation ought to be made of the properties of the underlying companies in order to determine the value of the property to be used as a basis for the issuance of stock, the assumption must be made that the new stock (plus other obligations) exceeds the fair value of the combined properties. If this assumption be true, and should this commission for that reason withhold its approval of the proposed consolidation, and thereby prevent the consolidation, it is perfectly obvious that the same amount of stock would be outstanding subject to sale. As far as the investing public is concerned, the conditions are not changed, whether or not the consolidation is consummated.

STATUS OF SECURITIES PREVIOUSLY ISSUED

"The total amount of securities now found to have been issued by public utilities has developed under the laws of this state prior to the enactment of the public utilities law. The act which created this commission provides that stock may be issued for the acquisition of property, for the construction, extension, or improvement of, or addition to, the facilities of a utility, for the discharge or lawful refunding of its obligations, or for reimbursement; hence it would appear from the record in this case that the underlying companies are justly entitled to issue securities for existing outstanding obligations to the amount of $560,331.25, provided application be made to this commission for approval of the issuance of securities for taking care of the said amount, and provided further that proof be made before the commission that the said amount has been expended in additions and betterments to the properties, constituting legal obligation of the constituent companies.

"Following the previous holdings of the Illinois commission, there can exist no question relative to the rights of the underlying companies to issue additional securities, either stocks or bonds. If stock were issued in lieu of the said floating indebtedness of $560,331.25, the same would be stamped with the approval of this commission, and, as far as the investing public is concerned, it would be accepted *prima facie* that this par-

ticular stock which bears the commission's stamp of approval was based upon value to the amount of the issue of stock. Theoretically speaking, this is true, inasmuch as the par value of stock authorized by the commission represents actual expenditures for improvements. But the real value of the said stock, even though stamped with authentication by this commission, is no greater than that of the previously existing shares issued under olden day business ethics. It is true that some of the existing water in the stock is squeezed out, owing to the fact that the new solution is not so thoroughly diluted, but it will be several years before the solvent will become saturated with tangible values.

"As an example, assume a quite common case of a company which has been capitalized some years ago at $100,000, which has installed plant and equipment to the value of $50,000, and which has issued capital stock to the full amount of $100,000. As the company grows, improvements and betterments costing another $100,000 may be installed. Meanwhile a regulatory body has been established, and this regulatory body authorized the issuance of another $100,000 of capital stock against betterments which actually cost $100,000. Now there exists a condition wherein the total capitalization is $200,000 based on property costing $150,000 to install. The initial stock ratio, which was 50 cents on the dollar, in mingling with the new stock reached a ratio of 75 cents on the dollar. Likewise the new stock which bears the commission's stamp of approval, signifying to all intents and purposes that such new stock represents actual property to the par value of the stock, in mingling with the old stock also reaches a ratio of 75 cents on the dollar. Obviously, without a reorganization, the ratio of such combined stock will never reach unity, but under a continuance of regulation conditions surely will improve with time. Despite the most earnest and painstaking efforts of regulatory bodies, it is practically impossible to remedy in a jump such past corporation practices as have done much to necessitate the regulation of our public utilities. During the transition period from a careless past to a better future, the investing public will be misled if it assumes without inquiry that the authorization which this commission causes to be stamped on all securities issued at the present time by public utilities is a guaranty of the value of tangible property.

VALUE OF STOCK DETERMINED BY EARNINGS

"I am somewhat of the opinion that should it be deemed necessary to cause a valuation of the property to be made wherever consolidations are contemplated and to disapprove consolidations unless such a valuation is made, the same policy should be pursued whenever this commission authorizes a security issue for any purpose whatsoever in connection with an existing utility. Therefore, it would naturally follow that, should it develop in a given case that the outstanding securities (par value) are in excess of the value of property, no funds nor money could be raised for additions, betterments, etc. If the commission should take such a view, and should create a condition wherein the utilities would be unable to raise funds for purposes of additions, betterments, etc., the result doubtlessly would be that the public would receive inadequate service and higher rates, and the utility in many instances would be forced into receivership. Even though a valuation be made in all security-issuance cases, who is to be benefited thereby? I doubt seriously if either the present owners of stock or the general public would be greatly benefited. Possibly future purchasers of stock would benefit by the knowledge of actual tangible values of property behind the stock issuance. But after all has been said and done, the value of stock, either to the present stockholders or to the future investors, is established and determined by the net earnings which the company is able to make, by the confidence in the company's officials, by the wisdom of its management, and by its future prospects. I cannot believe that the Illinois public utilities law contemplates the impractical and endless task of making valuations of every utility property against which securities are to be issued. An accurate appraisal and a proper valuation require expenditures of a magnitude which requires mature consideration before inflicting the same upon the taxpayers of the state of Illinois. I do not believe that it is the intent of the law that this commission should undertake to correct all the evils that grew under past unregulated conditions, nor that this commission act retroactively, so to speak, by requiring valuations of all existing utility properties when allowing additional securities to cover additions, betterments, etc., in all cases where previously existing outstanding securities may exceed the value of the tangible property. Should the commission adopt a policy of entering upon valuations whenever security issues are involved, it is predicted that a general financial upheaval as far as the public utilities of the state of Illinois are concerned would result therefrom. In the final analysis the public would be the loser. I believe that the law as written intends that this commission should see that new security issues of existing utilities represent actual property, and that the law does not contemplate that this commission should concern itself with past issues for the purpose of correcting the evils of former years. This commission, in following the law as I believe it intends, by insisting that new securities be represented by property, in a reasonable length of time will secure an adjustment in the relation between outstanding securities compared with value of property. In the case of an entirely new concern, however, I am firmly of the opinion that $1 of securities should stand for $1 of actual property."

Conditions Influencing Central Steam-Heating Installation

The Indiana & Michigan Electric Company of South Bend, Ind., is laying mains for a central steam-heating system which will cover a district two blocks wide and ten blocks long in the business center of the city. Although it will not be necessary to install additional boiler capacity, it is estimated that the cost of labor and material on the job will be at least $110,000.

There were two principal considerations which governed the company's decision to install this steam-heating system, namely, the demand for it on the part of the public and the company's peculiar position as regards generating equipment. As the system now stands the company operates hydroelectric plants on the St. Joseph River at Elkhart, Twin Branch, Buchanan and Berrien Springs, which stations contain generators rated at 3000 hp., 6000 hp., 4000 hp. and 9000 hp., respectively. There is also a 14,000-hp. steam stand-by station at South Bend. The peak demand on the boilers at South Bend, as far as the electric load is concerned, comes at such seasons of the year as a scarcity of water in the river occurs. The peak demand on these same boilers for steam heating, it is estimated, will not occur simultaneously with a period of low water. Hence the boilers at South Bend will be used as stand-by equipment for the hydroelectric plants and also as steam-heating units. It has been and will continue to be the company's policy to keep its boilers under steam at all times so that the load may be transferred to the steam station on short notice in emergencies.

The Objects of Modern Co-operation

Development of the New Attitude Which Appeals to the Intelligence and Educates as to Production, Overhead and Selling Costs

BY THOMAS M. DEBEVOISE

Co-operation Supplants Force

Because of the great interest in co-operation the ELECTRICAL WORLD *asked Mr. Debevoise, counsel of the Associated Manufacturers of Electrical Supplies and of the Electrical Supply Jobbers' Association, to discuss this subject, with particular reference to the following concrete question:*

"How do the co-operative activities of to-day compare with those of the past?"

The discussion of Mr. Debevoise brings out in sharp contrast the old inhibited policy of force and the present-day approved attitude of co-operation.

THE difference between the old-time trade agreement and modern co-operation is largely the difference between force and intelligence. Fifteen years ago competitors acting together in associations made arbitrary agreements, the breach of which was penalized by forfeit or fine. These agreements were generally broken by members who thought they could make enough money by breaking them to offset the forfeit or fine if they were caught.

THE OLD PRACTICE

Prices fixed by these agreements had little or no relation to the cost and expense of making and selling the merchandise affected, but generally represented what the members of the association thought "the traffic would bear." The result was that prices were put up so high that when they were maintained, even approximately, new competitors came into the field. These new competitors, doing business at a comparatively small expense, could cut the association prices and still have a good margin of profit left at the end of the year. As a result they grew rapidly, and when they had become real factors in the business they were admitted to the association. The business soon became overcrowded and demoralized conditions developed, followed by bankruptcy or combination of interests.

WHEN FORCE RULED

There was no incentive to the members of such associations to meet competition through the economy and efficiency made possible by a careful study of costs, expenses, etc. Their only care was as to how the price could be kept up so as to leave net profits at the end of the year. They wished to leave each meeting of the association feeling that they were richer than when it began. Their first thought was in regard to present prices—they spent little time building together for the future. Prices were put up by force, and every effort was made to maintain them by force. This force was directed not only against the members of the association, but sometimes against competitors who tried to break into the field.

CO-OPERATIVE WORK TO-DAY

Co-operative work to-day consists of an appeal to the intelligence of the associated competitors, their education as to the cost of manufacturing their products, including overhead and the proper division of it among the various classes of such products, a study of sales expenses, the standardization of products and of manufacturing and selling methods, etc. The theory as to the effect of co-operation on competition now is that if a man understands exactly what it costs him to do business he will realize that if he does not receive at least that cost in exchange for his goods he will be fooling, not his competitors but himself, that selling goods at cut prices is therefore not an accomplishment at the expense of his competitors, but at his own expense, and that the result will eventually lead to his financial ruin.

LAW AND THE GOVERNMENT

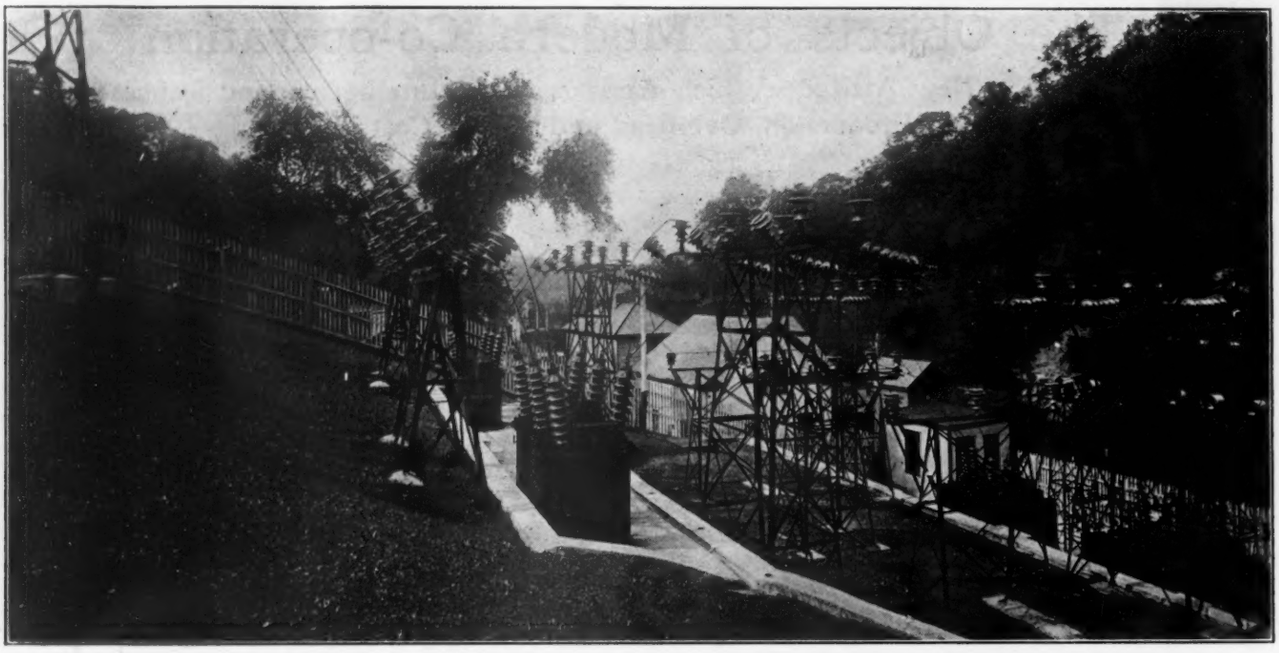
There has been so much talk within the past year or so about associated effort, cost accounting, efficiency, etc., and various government officials have gone so far in encouraging manufacturers to associate together, that it is well to point out that the law has not been changed; that it is still illegal to make agreements in restraint of your own trade, and illegal and unfair to make agreements in restraint of your competitors' trade. The Department of Justice is always ready to act on receipt of evidence of the first class of agreements, and the Federal Trade Commission has particular jurisdiction as to the second class. Competition must still go on, but the hope is that associated effort will cause the old destructive competition to be supplanted by new intelligent competition; that the merchants of to-day, as a result of a more thorough and detailed knowledge of their own business, will look for profits rather than volume, and that as a result of their friendship with their competitors and their confidence in them engendered by contact, the very foundation of the old-time destructive competition will to a great extent disappear. There can be no doubt that more can be gained by showing a competitor the proper way to conduct his business, and thus to obtain a profit for himself than by persuading or forcing him to make an arbitrary agreement as to the prices he will ask for his goods. In the first case, he is guided by his own intelligence; in the second case, he is controlled only so far as may be by fear.

KNOWLEDGE AND CONFIDENCE

There have been attempts recently to combine the old method with the new, and by organizing associations with Sunday-school coatings and constitutions and by-laws full of self-serving declarations, to effect a cover for certain direct or indirect restraints on the business of the members. These attempts are foolish. The history of the old associations shows that nothing permanent can be accomplished by force. Knowledge and confidence are the by-words of permanent co-operative effort, and confidence is bred by companionship and fair play, not by arbitrary rules and agreements.

Electric Drive of Longest Coal Conveyor

The longest coal-conveyor line in the world—carrying a distance of 1290 ft., has been placed in operation by the Carbon Coal Company at Carbon, W. Va., using power from the central-station system of the Virginian Power Company at Cabin Creek Junction, W. Va. The capacity of the conveyor is 2000 tons a day.



CENTRAL AND SECONDARY SECTIONS OF SUBSTATION INSTALLED ON HILLSIDE AT STEUBENVILLE, OHIO

A 3000 to 5700-Kva. Substation Built at Low Cost

Arrangement of 66,000 and 16,500-Volt Outdoor Equipment on Terraced 21 Per Cent Natural Grade Installed Complete at Cost of $4.55 per Kva.—Provisions for Operating Transformers at Double Rating

BY L. J. MCKENZIE

Engineer Overhead Construction, Steubenville & East Liverpool Railway & Light Co.

THERE is no longer any question regarding the economical and practical advantages of the small outdoor substation of all voltages. Some of the advantages of the outdoor installation of both large and small ratings are: 1. Decreased initial cost by omission of building. 2. Readily adaptable for enlargement or alteration. 3. Simplicity, both of construction and operation. 4. Less steel required than is used to truss the roof of an indoor station. 5. Safety-first features due to increased clearance space. 6. Fire hazard reduced to a minimum. 7. Elimination of cost of water in small stations. 8. Overload possibilities in winter. In addition the outdoor design of substation is especially well adapted to fulfill requirements where topographical conditions are such as to make the construction cost of an indoor substation large, if not prohibitive.

One of the first high voltage 66,000-volt outdoor steel substations to be installed in a thickly settled industrial district is that of the Steubenville & East Liverpool Railway & Light Company at Steubenville, Ohio, in the center of one of the largest steel mill groups of the Pittsburgh district. In this case the installation of a brick or concrete indoor station would have increased the cost from 25 to 40 per cent.

EMERGENCY RATING OF TRANSFORMERS

The equipment of the outdoor substation as shown in the accompanying illustrations consists of two Westinghouse 1500-kva., three-phase, 60-cycle, 66,000/16,500-volt transformers of the self-cooling radiator type, with the necessary protective apparatus and switches so arranged that either of the transformers may be tapped to either of two incoming 66,000-volt transmission lines. Each is provided with water-cooling coil designed for emergency use, and with 8½ gal. per minute circulating water this 3000-kva. transformer bank can carry between 5700 kva. and 6000 kva. continuously without exceeding a temperature rise of 55 deg. C. Lightning protection is provided on the high tension end by two sets of Westinghouse Type A, 66,000-volt, three-phase, electrolytic lightning arresters, while the low tension end is protected by two sets of the same type of arresters, but for 16,500-volt operation.

Power is furnished to this substation from a double circuit, three-phase, 60-cycle, 66,000-volt steel tower line of the Sunnyside Electric Company, Wheeling, W. Va., one of the properties of the American Gas & Electric Company. These two three-phase lines are dead-ended on steel towers which carry choke coils and Burke outdoor disconnecting switches, which are used to disconnect the oil circuit-breakers from the line. Between the circuit-breakers and the transformers five three-pole switches are provided to sectionalize the installation so that either one or both transformers may receive power from either or both incoming 66,000-volt lines. The same system of switches is employed on the secondary or 16,500-volt side of the station so that energy may be delivered from this station to either or both transformers over either or both secondary lines to the old power station which is now being employed as a substation.

As shown in the accompanying illustrations, this substation is situated on the side of a hill, which was the only suitable location available. To have made it of the indoor type would have made necessary a large building to house the equipment, and called for a great deal of

excavation. By deciding on the outdoor type, excavation work was almost entirely eliminated by terracing the hillside with concrete foundations for supporting the steel structures required for transformers, oil switches, lightning arresters and other auxiliary apparatus. The cost was considerably less than would be the case were foundations for buildings necessary. Less steel, too, was used than would probably have been necessary to truss the roof of an indoor station of this size. The actual cost of the higher insulated weatherproof apparatus was slightly greater than that required for the indoor type, but this increase when compared with the cost of the entire station as installed is almost negligible.

One of the marked features in connection with this station, and a characteristic of outdoor stations in general, is that clearances are greatly increased, making for safety. There were few obstructions, and straight-line work was possible. Due to the absence of entrance bushings, the wiring was easily kept out of reach of operators and at the same time the fire hazard reduced to a minimum.

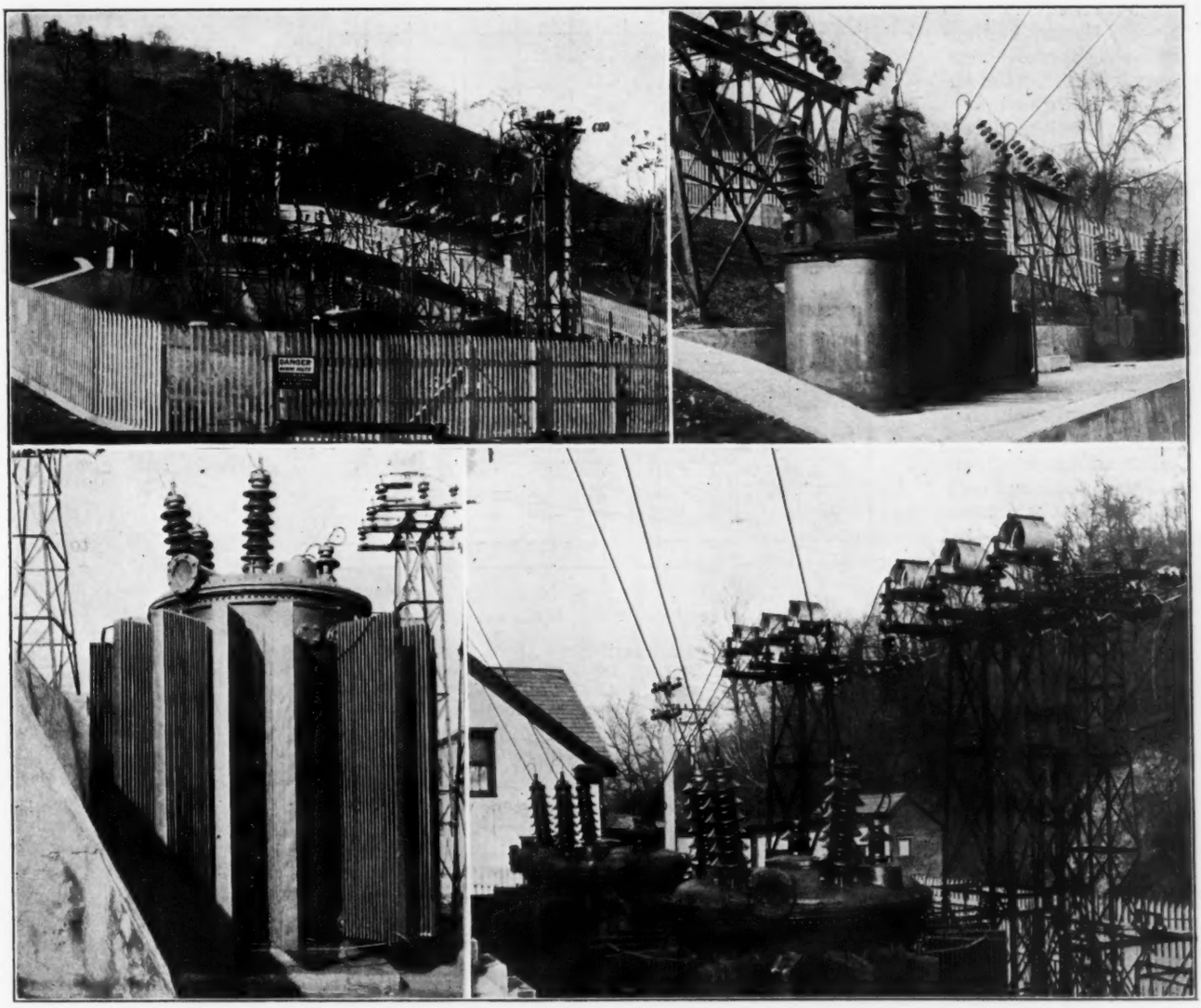
The station has proven very satisfactory, and is liked because of the minimum amount of attention required and on account of the simple and rugged construction of the apparatus, including switches and control equipment. All of which indicates that very little repair work is necessary. An admirable feature also is that should it ever be desired to move the station, it can be easily taken down and placed on a new site. An attendant lives near the substation and makes periodic inspections.

COST OF INSTALLATION

The comparatively low first cost of this station is a noteworthy feature. The maintenance cost has also been exceedingly low. The total cost of the station and its equipment follows:

Land—3 acres	$1,250.00
Excavations and removal of old brick dwelling, cinders and sodding	2,407.00
Concrete foundations, etc	2,458.00
Drains and sewer	46.00
Fence	278.00
Frame office	155.00
Steel towers and equipment:	
Two 1500-kva. O. I. S. C. radiator-type transformers, with auxiliary water cooling coils, 3-phase, 60-cycle, 66,000-33,000-volts high tension, 13,200-volts low tension design	11,000.00
Two sets of 66,000-volt, 300-ampere, 3-phase, automatic oil breakers. Two sets 66,000-volt, 3-phase electrolytic lightning arresters. Two sets of 16,500-volt, 3-phase electrolytic arresters	6,050.00
Nine sets 66,000-volt, 3-phase Burke disconnecting switches. Five sets 16,500-volt, 3-phase Burke disconnecting switches. Superintendence, engineering and general expenses	2,364.00
Total cost of outdoor station	$26,008.00

With water in the auxiliary cooling coils the station is rated at 5700 kva. The total cost of station per kva., therefore, is $4.55, a figure which is very low when compared with the cost of indoor installations.



ARRANGEMENT OF SUBSTATION EQUIPMENT ON 21 PER CENT GRADE—66,000-VOLT OIL CIRCUIT BREAKERS—1500-KVA. THREE-PHASE, RADIATOR TYPE TRANSFORMERS AND 16,500-VOLT TOWERS AT SECONDARY END OF STATION

Reckoning with Costs of Superseded Equipment

Reasons Why Expenditures for Abandoned Elements of Plant May Fairly Remain in the Capitalization of a Public Utility Corporation

BY EDWIN D. DREYFUS

IN scarcely any other industry has supersession been more pronounced than in the development of the central electric station business. Improvements occurred in rapid succession, causing equipment which was mechanically and electrically sound to become inadequate and economically inadvisable for continued service. As a prominent example, the effect of the vast strides that were made in power plant development may be discussed instructively.

The power plant represents in round numbers about one-third to one-half of the total investment of the electric utility and consequently any noted changes and substitution in this part of the system have had a marked effect. In a way, Corliss engines replaced the small high-speed types; Corliss engines were in turn supplanted by moderate size steam turbines; and finally, the scattered medium size turbine stations have given way to the mammoth turbine plants of to-day. The form in which the supersession has taken place in different installations has evidently been varied but the principle has remained the same.

The advent of superseding types is not only difficult, but in most cases it is impossible to foresee. While advance information may be spread regarding the progress of new inventions and pending improvements in the art, new types and methods not infrequently emerge from the chrysalid stage long before a utility could reasonably set aside out of its earnings a reserve fund to cover the apparent decline in the value of equipment affected. Hence there inevitably must be a considerable margin between the amount of actual investment of the utility and the present replacement cost of its existing equipment and facilities.

A striking analogy of the utility to the snail-shell was drawn by R. A. Phillips in a classic article on the "Snail Shell—An Example of Capitalization"* in which he portrayed a likeness for the reason that both the snail and the utility were obliged to support and sustain a significant amount of "disused members" or discarded elements in the course of their normal growth. The causes of such burden of the modern electric utility are made manifest immediately in the conditions that have surrounded consolidations and extensions.

In the evolution of our electric central-station systems entire generating plants have been abandoned and replaced by a single large station located usually at the center of load of a large distributing area. But is the effect of such substitutions upon capitalization realized sufficiently? Judging from the expressed opinions in many academic—and a few professional—discussions, the answer is in the negative.

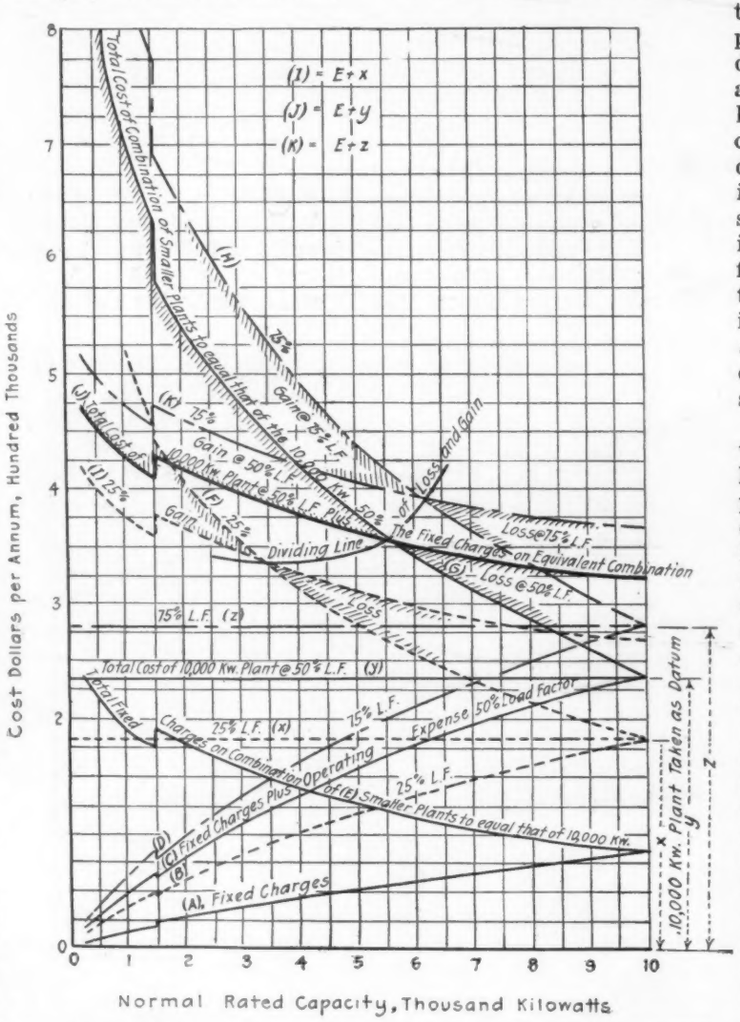

Cost Dollars per Annum, Hundred Thousands
Normal Rated Capacity, Thousand Kilowatts
(I) = E + x
(J) = E + y
(K) = E + z
Total Cost of Combination of Smaller Plants to equal that of the 10,000 Kw. Plant @ 50% L.F. Plus Loss and Gain
(H)
75%
Gain @ 75% L.F.
(K)
75%
Gain @ 50% L.F.
(J) Total Cost of 10,000 Kw. Plant @ 50% L.F. Plus
(I) 75%
(F) 25%
Gain @ 50% L.F.
Dividing Line
The Fixed Charges on Equivalent Combination
Loss @ 75% L.F.
(G) Loss @ 50% L.F.
75% L.F. (z)
Total Cost of 10,000 Kw. Plant @ 50% L.F. (y)
Total Fixed Charges on Combination Operating
25% L.F. (x)
75% L.F.
Expense, 50% Load Factor
25% L.F.
of (E) Smaller Plants to equal that of 10,000 Kw.
(D)
(C) Fixed Charges Plus
(B)
(A) Fixed Charges
10,000 Kw. Plant Taken as Datum
x
y
z

FIG. 1—DEVELOPMENT OF ULTIMATE COSTS FROM FIGS. 2 AND 3, SHOWING THE ECONOMIC ABILITY OF A SINGLE MODERN STATION TO EFFECT A SAVING IN COST IN ADDITION TO SUPPORTING THE IDLE INVESTMENT IN THE PLANTS DISPLACED

An especial example will be found in the history of the central power plant as developed by the characteristic tendencies in operating costs and fixed charges. In Fig. 2 the steady reduction of operating costs is to be observed as the size of the units and the load factor increase. The unit installation cost of the plant which determines the fixed charges shows the same tendency, as indicated in Fig. 3. To obtain the total plant costs the data contained in Figs. 2 and 3 are combined in the manner given in Fig. 1: *A* represents total fixed charges in dollars and cents per annum; *B* shows total annual costs at 25 per cent load factor; *C* at 50 per cent, and *D* at 75 per cent.

LARGE COST IN SMALLER STATIONS

For outputs from a proper combination and number of small plants to correspond to that produced by the large station of 10,000-kw. rating, the cost is shown by curves *F*, *G* and *H* in Fig. 1. Obviously, the total cost to produce the power by the smaller stations is much in excess of that incurred in operating a single large and efficient plant. In deriving these curves, consideration was given to the extra cost attached to the central power plant due to losses and expense in transmitting to the distributing load centers. It is evident that the saving

*See *Public Service Journal*, July, 1915.

obtainable in operating a plant of, say, 10,000-kw. rating instead of four each of 2500-kw. rating is sufficient not only to meet all operating expenses and pay fixed charges on the investment in the new plant, but also to defray the outstanding fixed charges on the smaller stations to be discarded; and besides leave a fair balance for discarded property should be made in a valuation—says:

" * * * As the discarded equipment is no longer used or useful for service, under ordinary conditions, it should probably be eliminated from the valuation for rate making purposes. The statute limits the scope of the investigation to ascertaining the value of the active property of the utility. Sec. 1797m 3 Ch. 499, laws of 1907."

With regard to the Wisconsin commission, it may be well to state that although it has been limited by law to confine itself to a property as found at the time of investigation, it has treated these questions and problems of valuation in a broad manner when looking into the expenses which the utility had undergone in bringing its business up to its present point of development.

This stipulation—*used and useful for public convenience*—in public service laws, opens the way for contention between representatives of the public and the utility due evidently to the restrictive language of the law.

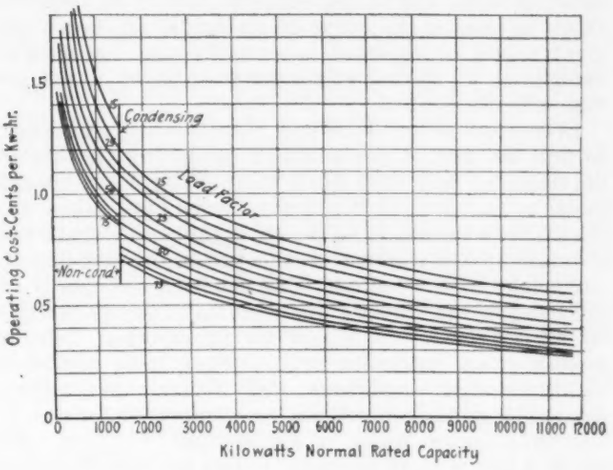


FIG. 2—TYPICAL PLANT OPERATING COSTS

ance. The company then is not only placed in a position to reduce its rates, but also to increase its profits if its entire receipts previously had not been altogether compensatory.

CENTRALIZATION CAUSES ABANDONMENT

It is therefore significant in relation to regulation that the centralizing of load has usually carried in its wake the discarding of equipment in good mechanical condition but in relative terms no longer efficient and adequate. However, it is to be borne in mind that this same apparatus when first installed had been appropriately and wisely selected. Now at the time of inquiry in some phase of regulation, with the equipment no longer operated—and possibly having been dismantled—the obvious finding would be that such plant or equipment is not at present "used and useful for public convenience and necessity, *i.e.*, employed in the service of the public" and accordingly may be omitted in the determination of fair value and allowable earnings. The probable consequences, as such study (Fig. 1) reveals, would be that the investment in the new improvements had thus reacted to prejudice investments previously made in the earlier installations.

Some cases of how this feature of development has been dealt with by our courts and commissions should be noted. Justice Hughes, in a recent case of Simpson vs. Sheppard, 230 U. S. 352, decided on June 9, 1913, commonly known as the "Minnesota rate cases," in delivering the opinion of the Supreme Court quoted the Smythe vs. Ames case as follows:

"The basis of calculation is a fair value of the property used for the convenience of the public. What the company is entitled to demand in order that it may have this compensation is a fair return upon the reasonable value of the property at the time of its being used for the public."

ATTITUDE OF WISCONSIN COMMISSION

The Wisconsin Railroad Commission, in several of its decisions, has made a similar interpretation of the public service law as bearing upon "property used or useful for public convenience," and in its decision in the City of Appleton case, dated April 28, 1915—a rate-making case dealing with the question of what allow-

CONCLUSION OF MASSACHUSETTS BOARD

More logical views of this subject have been held by certain authorities, as set out interestingly in the fixing of the maximum rate in the case of the Marlborough Electric Company by the Board of Gas & Electric Light Commissioners of Massachusetts. With reference to discarded property the board says:

"In the absence of evidence of mismanagement or dishonesty the board believes that under the long-established policy of the commonwealth all the paid-up capital honestly and prudently invested should under normal conditions be recognized in determining what is a fair rate, but it does not follow, however, that idle capital is to be on the same footing as the active. The board distrusts a valuation as a decisive test of investment where actual cost of the property and the circumstances under which it was acquired can be ascertained. It is also of the opinion that one of the important functions of depreciation, beside taking care of the daily wear and tear, is the anticipation of changes in the art and in the possible intervening conditions which, although they may have little or no relation to the useful life of the physical property, yet cannot ordinarily be foreseen. It realizes, however, that a prudent management cannot always have provided fully for changes

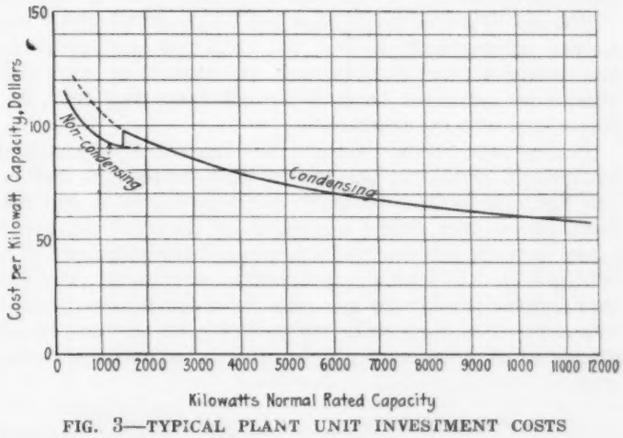


FIG. 3—TYPICAL PLANT UNIT INVESTMENT COSTS

of this character, and especially in the first stages of the industry, or in a case like this where the business of the earlier years was not profitable. It believes that a proposition to allow the right of the investment to a return, but to disallow in any substantial measure the obligation to keep it good, is not consistent or sound.

"Applied to this case the views which the board has expressed do not result in a conclusion as to the allow-

able return so different in amount from the claim made by the city as appreciably to affect a finding as to price. But the board does believe that, under all the circumstances sufficient emphasis was not given to the need of a more adequate provision for depreciation."

In the light of the views set out above it is evident that the utility must carefully measure its course in planning to take care of increasing loads. Owing to unfavorable action there have been companies which have hesitated to invest in new plants for replacing older and less efficient plants for the reason that, in the face of strict regulation, this would have resulted, as previously shown, in discounting previous investments. On the other hand, there are companies which have made improvements in the way of new central stations but have adopted the policy of keeping the outlying smaller plants in service at an appreciable but unnecessary cost in order that they may be in position to claim that the same were "used and useful for public convenience" and that they were therefore entitled to a return upon such investments. A plan of this kind is fundamentally uneconomic, but it is a means, however, of safeguarding existing investments.

ACCOUNTING IN NEW JERSEY

One commission, the Board of Public Utility Commissioners of New Jersey, has in a way embraced these contingencies in its classification of accounts by including an item for "abandoned property." The text for this account is, in part:

"When any important piece of property, other than land, included in fixed capital accounts, is abandoned by reason of its being replaced with enlarged, improved, or more efficient property, the corporation may, if so authorized upon application to the board, open on its books a 'property abandoned' account.

"When property is charged to this account, it should be at the original cost (estimated, if not known), less salvage, and less the amount of accrued depreciation applicable thereto. The appropriate property account should be credited with the cost of the property; 'accrued amortization of capital' should be charged with the amount of accrued depreciation; the proper accounts should be debited with salvage; and the balance should be charged to this account, to be extinguished during a period of years by charges against income or against surplus, according as the board, on application, decides.

"Note.—This account does not apply to property acquired subsequently to Dec. 31, 1912; on such property the charges for depreciation in operating expenses should be sufficient to care for all wear and tear, obsolescence and inadequacy."

It does not follow that the writing off of abandoned equipment is always the wisest plan to pursue, and in the light of broad judgment and experience it has not been necessarily found advisable or desirable in many cases to write off the value in discarded equipment. Mr. Phillips, in his studies, referred to previously, showed that approximately 20 per cent in outgrown equipment was carried by companies which had gone through rapid stages of development. This table is reproduced herewith as it is particularly pertinent.

	New Construction		Previous Construction		
Period	Kw.	Useful Investment	Unused Investment	Total	Per Cent Outgrown
1	500 at $100	$50,000	$12,500	$62,500	20
2	2,500 at 100	250,000	62,500	312,500	20
3	12,500 at 100	1,250,000	312,500	1,562,500	20
4	62,500 at 100	6,250,000	1,562,500	7,812,500	20

BURDEN OF HEAVY AMORTIZATION CHARGE

If the amortization charge was to be set up in order to retire the entire investment in discarded equipment, say in a limited period, we would probably find that the burden so created would prevent the company from making low rates for the large volume of business expected to be obtainable with its new station. It could not have acquired the large volume of business previously, without having made the new power plant improvements. To enforce high amortization charges probably would require that the rates be held up to their existing level, and if the company should be restricted from increasing the scope of its operation its development would be retarded accordingly and the ultimate benefits to all classes of consumers delayed if not permanently forestalled.

In matters of this kind it is therefore quite necessary to find the key to the situation producing the highest development, and then when these matters are brought under review none of the factors which have engendered the utility's success must be lost sight of or swept aside. It would appear that the trouble lies in the fact that the technology of the industry has not been sufficiently appreciated in the framing and administration of the public service laws. It should be remembered that the growth of an institution must inherently be responsive to surrounding conditions, and if these are circumscribed by undue limitations the property will never attain the position which it was destined to reach. For the best interests all around a proper latitude of method and policy must be allowed, always confined, of course, to reasonable bounds of action.

Indiana Company's Specifications Reduce Condenser Costs

The Indiana Railways & Light Company of Kokomo, Ind., has placed a rather unusual form of order with the Wheeler Condenser & Engineering Company. It calls for a condenser without tubes with the understanding that the central station company will supply the tubes at the manufacturing company's plant some time between the date of purchase and the date of delivery. The idea in ordering the condenser in this way is to evade, if possible, paying the present extraordinary high price for brass tubes. It is expected that some time during the coming nine months, between the purchase date and delivery date, brass tubes will be cheaper and can then be bought for the condenser.

It is planned to effect a further saving by installing at first only 9000 sq. ft. of tube surface in the condenser instead of the 12,500 sq. ft., which the unit will ultimately contain. In this manner the investment in 3500 sq. ft. of tubes can be further delayed without in any way interfering with the operating efficiency of the condenser. This is possible for the reason that the 5000-kw. turbine, with which the condenser will be used, will be only lightly loaded at first. Under light load conditions the condenser will operate as satisfactorily with 9000 sq. ft. of tubes as with its full quota. The extra tube holes in the condenser will be closed with threaded brass plugs. It will be necessary for the Indiana Railways & Light Company to install the additional 3500 sq. ft. of tubing with its own operating force when the full tube space is required.

A General Electric turbine having a rating of 5000-kw. at 80 per cent power factor has also been ordered. This will be a two-phase, 2300-volt, 60-cycle machine on which ten months delivery was promised. It will be wound in a manner that will permit reconnecting for three-phase, 4000-volt operation should the company decide to make such a change. The air pump purchased is of the rotation, dry-vacuum type. The 14,500-gal. circulating pump and the hot well pump will be driven by separate Curtis turbines. The 5000-kw. unit will replace a 100-kw. Allis Chalmers turbo-generator which the company expects to sell.

Results of May Light and Power Operations

Earnings Ahead of Last Year by $4,400,400, or 15.9 Per Cent; Increase in Output 360,000,000 Kw.-Hr., or 24.1 Per Cent

ALTHOUGH May, 1915, was the first month of that year to show any substantial gains in the results from central station operation, May of this year suffered none in comparison. In fact, according to the regular monthly compilation made by the ELECTRICAL WORLD of earnings and output from more than 60 per cent of the light and power industry, the percentages of gain of May, 1916, over May, 1915, were greater both in income and output than those of April, 1916, over April, 1915, by 0.4 per cent. The only month to surpass May in the matter of percentage increase in income was March last, which was the record month in central station history for volume of business.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1915	1914	Per Cent Increase	1915	1914	Per Cent Increase
June	65	17,603,614	16,476,255	6.9	925,067,308	836,292,076	10.6
July	64	18,488,793	17,200,827	7.5	971,699,054	880,768,487	10 4
August	64	17,342,796	16,024,893	8.2	951,752,053	853,381,696	11.3
Sept.	65	18,547,170	17,074,927	8.6	1,003,606,094	871,573,412	15.1
Oct.	65	20,112,813	18,329,490	9.8	1,087,786,658	949,288,459	14.7
Nov.	65	21,899,048	19,720,232	11.6	1,150,669,073	948,704,941	21.3
Dec.	64	23,418,774	20,962,264	11.8	1,230,655,404	1,004,108,399	22.5
		1916	1915		1916	1915	
Jan.	65	25,286,336	22,352,721	13.2	1,200,672,452	984,205,683	22.0
Feb.	65	22,133,485	19,175,537	15.3	1,121,452,738	869,537,132	29.1
March	65	22,027,627	18,722,742	17.8	1,212,363,217	969,888,339	25.2
April	64	21,206,946	18,375,014	15.5	1,137,602,995	920,464,917	23.7
May	63	20,230,748	17,456,496	15.9	1,164,418,499	939,520,766	24.1

Earnings from the sale of energy during May amounted to $32,100,000 for the entire industry, a gain over the previous May of $4,400,000, or 15.9 per cent. The output during May was 1,850,000,000 kw.-hr., a gain over May, 1915, of 360,000,000 kw.-hr., or 24.1 per cent. Both income and output were less than for the previous few months, owing to the lengthening of the daylight period.

During the first five months of 1916 the earnings from light and power sales were $172,100,000 against $149,300,000 for the first five months of 1915, an increase of $22,800,000, or 15.3 per cent. Should the

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	April	May
INCOME:										
Group 1	7.2	7.3	8.7	9.8	10.2	10.7	14.1	16.0	13.9	14.4
Group 2	9.1	10.0	11.4	12.8	13.8	21.3	20.0	18.5	17.0	17.9
Group 3	14.5	15.4	23.4	18.0	19.8	18.3	20.7	28.1	24.7	26.2
Group 4	8.0	9.0	8.7	11.9	13.6	13.1	15.7	17.3	17.4	16.0
Group 5	7.5	11.9	5.7	13.0	13.0	7.2	18.5	26.5	16.1	26.7
OUTPUT:										
Group 1	9.7	12.2	10.7	17.0	19.0	19.0	25.4	22.0	20.0	21.3
Group 2	19.0	18.9	21.4	29.0	31.5	28.0	40.6	28.1	25.5	18.4
Group 3	13.0	24.0	27.3	36.0	33.0	33.2	39.6	39.0	37.7	40.0
Group 4	10.9	11.3	13.4	18.0	16.3	22.6	29.7	18.2	22.7	23.3
Group 5	12.7	19.3	1.7	13.4	9.7	8.5	22.4	29.9	32.0	33.2

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	April	May
INCOME:										
Group 1	11.0	10.6	12.7	13.8	14.8	16.5	18.0	21.5	16.0	17.0
Group 2	9.6	10.3	12.6	12.7	16.1	15.4	19.9	19.0	21.2	19.5
Group 3	16.5	14.7	17.3	15.5	22.8	22.1	29.7	38.7	15.5	24.0
Group 4	9.2	10.0	8.8	9.0	9.6	11.3	15.1	18.1	13.2	13.5
Group 5	21.2	5.8	8.3	13.7	23.5	20.6	26.3	54.5	27.6	28.0
OUTPUT:										
Group 1	17.2	19.2	20.8	28.7	26.2	29.0	38.5	30.9	25.0	28.2
Group 2	26.0	21.7	18.3	30.0	26.5	26.0	36.8	27.8	31.4	33.2
Group 3	12.3	14.4	8.7	23.0	22.5	39.5	41.6	49.0	38.1	43.0
Group 4	13.6	9.0	20.6	20.1	18.5	15.0	23.0	17.4	36.1	30.0
Group 5	15.1	8.5	1.8	51.0	14.5	22.6	25.6	58.7	71.8	55.0

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase
INCOME	June	67	2,063,423	1,874,575	10.2	69	6,945,986	6,628,523	4.8	57	4,993,410	4,492,411	11.2	88	3,409,738	3,281,696	3.9
	July	66	2,020,513	1,835,968	10.2	68	6,710,217	6,519,442	2.9	56	4,801,699	4,211,641	13.9	88	3,539,168	3,317,713	6.8
	August	63	2,057,635	1,855,140	11.0	68	6,853,118	6,511,307	5.3	56	4,749,082	4,231,322	12.2	88	3,545,454	3,288,729	7.8
	September	66	2,162,064	1,949,663	11.0	68	7,288,842	6,904,245	5.5	57	5,285,358	4,691,751	12.6	88	3,664,215	3,387,717	8.2
	October	66	2,327,214	2,073,059	12.3	68	8,096,982	7,550,808	7.2	57	5,820,653	5,153,314	13.0	88	3,798,012	3,477,051	9.3
	November	66	2,472,539	2,188,049	13.0	67	8,894,805	8,158,589	9.0	57	6,342,582	5,554,226	14.2	88	4,069,995	3,703,124	10.0
	December	66	2,817,557	2,448,813	15.0	67	9,335,396	8,529,866	9.4	57	6,983,909	6,063,349	15.1	88	4,150,045	3,773,810	10.0
			1916	1915			1916	1915			1916	1915			1916	1915	
	January	66	2,819,144	2,432,177	15.0	67	9,589,347	8,564,488	12.0	57	7,834,831	6,717,799	16.6	88	4,182,114	3,823,156	9.4
	February	66	2,599,760	2,185,967	18.8	67	8,978,797	7,854,345	14.3	57	6,660,062	5,568,337	19.7	88	3,761,364	3,443,182	9.3
	March	66	2,595,777	2,122,177	22.0	67	8,998,962	7,660,667	17.5	57	6,470,612	5,394,250	20.1	88	3,787,925	3,386,286	11.9
	April	64	2,221,544	1,898,749	17.0	67	8,794,056	7,596,567	15.8	56	6,289,092	5,292,974	19.0	88	3,825,701	3,520,381	8.8
	May	63	2,098,629	1,783,905	17.7	66	8,226,231	7,131,063	15.4	56	5,985,800	5,032,427	19.0	88	3,864,052	3,461,690	11.7
KW.-HR. OUTPUT	June	67	71,566,127	60,972,379	17.4	69	318,245,370	293,751,083	8.5	57	265,930,311	234,286,440	13.2	88	261,083,835	237,843,021	9.8
	July	66	71,025,184	60,755,381	17.0	68	320,371,761	293,909,832	9.0	56	264,498,989	232,541,585	13.9	88	274,488,534	258,475,004	6.3
	August	63	71,954,506	60,870,433	18.5	68	329,947,721	302,960,234	8.9	56	272,508,518	240,423,753	13.4	88	276,631,551	248,463,980	11.3
	September	66	74,835,203	63,716,224	17.3	68	358,765,971	319,549,780	12.3	57	286,893,057	247,046,941	16.1	88	279,133,989	237,795,633	17.5
	October	66	82,568,951	69,882,867	18.3	68	400,516,741	353,685,472	13.3	57	305,962,017	268,972,416	13.7	88	292,885,613	251,095,356	16.8
	November	66	87,193,883	69,359,620	25.8	67	420,584,253	355,151,259	18.5	57	333,528,905	269,870,536	23.7	88	301,772,412	248,913,893	21.0
	December	66	99,744,195	80,446,521	24.1	67	447,158,465	373,213,316	20.0	57	363,859,444	293,266,707	24.1	88	311,034,100	249,996,678	24.5
			1916	1915			1916	1915			1916	1915			1916	1915	
	January	66	97,072,794	77,029,974	26.2	67	431,201,554	356,809,437	20.8	57	362,121,067	284,407,361	27.5	88	301,645,060	258,982,414	16.5
	February	66	92,855,679	68,982,535	34.8	67	411,715,612	320,924,478	28.1	57	339,326,360	252,816,291	34.1	88	268,653,564	220,662,826	22.1
	March	66	97,321,924	74,958,898	29.9	67	439,660,902	349,347,454	26.0	57	360,872,072	282,179,673	28.0	88	304,327,753	255,450,143	19.3
	April	64	84,769,660	64,816,830	30.8	67	403,223,021	326,574,302	23.4	56	344,866,175	273,367,413	26.4	88	302,386,347	253,778,348	19.2
	May	63	84,578,623	64,213,497	31.6	66	409,529,049	335,858,864	22.0	56	340,384,799	271,415,785	25.3	88	328,085,119	266,506,583	23.1

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	April	May
INCOME:										
Group 1	4.0	4.4	6.2	7.6	8.3	11.1	13.7	16.7	15.1	14.5
Group 2	11.6	11.0	11.9	15.0	14.0	18.2	18.4	21.2	18.5	21.7
Group 3	8.5	8.9	11.0	10.0	13.1	11.9	14.6	20.5	15.3	17.7
Group 4	8.4	10.0	9.8	14.4	15.3	17.4	19.4	17.9	19.5	14.0
Group 5	2.0*	14.3	10.9	14.6	12.2	16.0	15.8	12.2	15.6	13.0
OUTPUT:										
Group 1	9.0	11.6	12.1	16.0	20.1	21.1	30.8	29.2	26.1	25.5
Group 2	15.0	16.3	16.8	26.6	25.5	26.4	33.4	25.6	35.6	11.3
Group 3	6.4	10.4	15.8	22.1	16.6	20.1	22.0	16.0	13.7	18.0
Group 4	13.2	12.5	14.8	22.0	18.9	15.6	21.8	20.9	19.0	12.6
Group 5	11.4	13.8	2.8*	18.6	20.6	1.5	24.0	13.1	8.9	35.0

*Decrease.

earnings for the remainder of the year keep up at the same rate as during the first five months, the 1916 total will be considerably more than $400,000,000.

The percentages of increase over last year for both income and output were less in May than in April in the Atlantic States and in the Central States. In the Far West, however, and in New England the reverse was true.

Attention is called to Tables II and III, where it will be noticed that the healthy condition of growth is not only not confined to any one section of the country but

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	April	May
INCOME:										
Group 1	12.2	12.4	12.3	17.0	15.8	14.3	18.3	19.3	18.2	18.0
Group 2	7.5	8.6	10.2	10.8	9.8	25.5	20.5	19.1	18.0	18.0
Group 3	21.0	22.0	22.7	24.0	25.1	24.3	27.0	23 0	26.7	27.2
Group 4	16.9	17.9	16.0	19.8	18.3	9.6	20.2	22.9	22.8	24.0
Group 5	20.2	13.5	24.7	9.6	18.0	5.7	11.1	14.4	9.4	21.3
OUTPUT:										
Group 1	12.2	15.2	10.4	22.0	21.9	24.9	30.3	25.2	24.7	25.0
Group 2	9.8	9.0	14.9	21.5	31.0	28.8	44.0	32.3	23.9	22.5
Group 3	31.0	29.3	34.2	43.0	41.2	32.5	44.0	40.6	43.5	41.0
Group 4	26.1	29.0	33.5	36 7	18.5	53.4	41.0	31.9	39.2	40.5
Group 5	25.1	48.0	3.0	17.3	20.6	13.3	15.9	19.1	10.1	14.7

is not confined to communities of any one size. In fact all of the decreases or low increases in comparison with the previous year have all been on account of some condition peculiar to that community at that time, as, for instance, a fire, or a severe storm or the loss of a large power customer, etc.

LARGE INDUSTRIAL LOADS

Letters received from operators in different sections of the United States all attribute the large increases registered in 1915 to additional power loads of considerable size. In New England the greatest factor in this connection without a doubt was the manufacture of war munitions for European armies. Practically every factory in New England has

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	April	May
INCOME:										
Group 1	7.0	13.9	7.5	7.5	6.0	11.6	6.7	8.5	3.9	7.2
Group 2	11.1	11.5	14.3	15.7	17.3	†	†	18.7	3.5*	2.3
Group 3	17.1	19.7	21.4	20.0	24.6	19.7	22.0	28.1	40.0	39.0
Group 4	0.2	0.3	0.1	4.3	10.8	3.0	8.2	17.5	11.7	13.8
Group 5	1.7*	15.0	3.1	13.5	3.9	10.5	17.8	26.3	12.0	18.6
OUTPUT:										
Group 1	6.3	8.4	7.1	9.9	13.1	9.1	13 0	22.7	8.0	12.0
Group 2	39.3	40.3	41.3	b1.0	56.0	†	†	28.3	3.6*	2.2
Group 3	18.5	49.2	52.4	67.0	67 0	56.0	68.8	39.0	80.0	79.0
Group 4	0.2	4.1	1.5	6.2	10.5	1.8	13.8	18.6	10.3	21.8
Group 5	8.0	21.0	3.5	8.3	1.0	1.0	20.1	30.0	11.7	33.2

*Decrease. †Results omitted owing to insufficient returns.

been working at full load since the fall of 1915, some engaged directly, and many others indirectly, in handling war orders. A large number of the mills operated formerly on water power with belt transmission. The uncertainty of this power led many of them to go in for

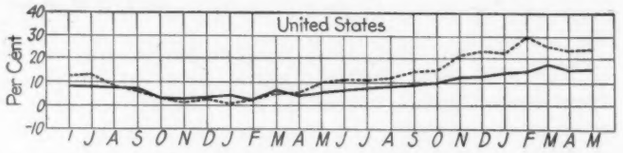


FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

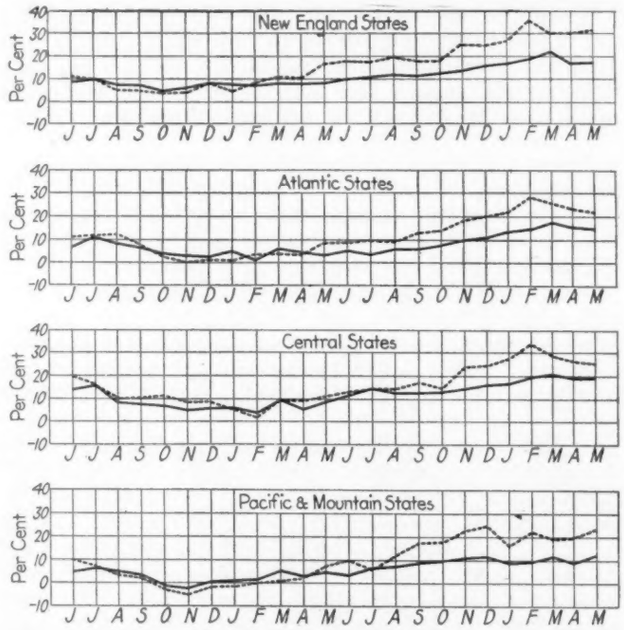
central station service, for this, if ever, was the one time when a shutdown must not occur.

In the Atlantic States also the mills were engaged in turning out large orders. The iron and steel mills were particularly busy. With one of the Southern companies, however, a large power contract expired, the loss of which affected the Atlantic output totals by about 0.5 per cent.

Service to zinc mines and iron and steel rolling mills was the predominating feature of the large power loads in the Central States. In the Pacific and Mountain States the large copper mining loads were responsible to an appreciable degree for the increases shown by this section. With copper selling as it did in May at 31 cents per pound, the producers naturally were making every effort to turn out the maximum amount of the red metal. The size of this load can readily be imagined when it is understood that one copper mining company annually consumes 700,000,000 kw.-hr.

EXPLANATION OF TABLES

The accompanying curves show graphically the percentage of increase contained in Tables I and II. The remaining tables give the percentage of increase for



FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

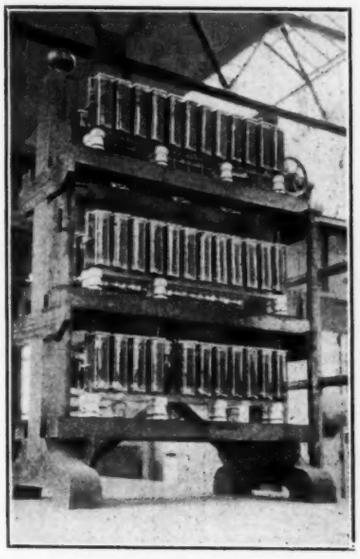
both income and output by sections in which the companies are grouped according to size as follows: Group 1 contains all companies operating in cities of over 100,000 population; group 2, those operating in cities having between 50,000 and 100,000 inhabitants; group 3, between 25,000 and 50,000; group 4, between 10,000 and 25,000, and group 5, between 5000 and 10,000.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Convenient Mounting for Small Battery

The fire alarm system for the city of Holland, Mich., is operated from the electric light plant. One operating force cares for both equipments, and since the principal duty in connection with the proper care of the fire alarm system lies in attending to the seventy-cell storage battery, the cells have been made easily accessible, as shown in the accompanying illustration. The battery is mounted on strips of glass supported by porcelain insulators attached to a hard pine wood rack. The whole battery equipment has been placed in an open space on the station's switchboard gallery. The control board and motor generator set for charging the cells is placed against the wall nearby. This rack is said to have proved a great convenience, and the fact that it does away with an unsightly wall shelf on which such batteries are usually placed has justified the small expense of its construction.



WOOD RACK FOR SMALL STORAGE BATTERY

How an Old Synchronous Generator Was Used to Improve Line Power Factor

The continuous demand of a silica-producing company at Oregon, Ill., supplied from the lines of the Illinois Northern Utilities Company is about 1000 kw. at 60 per cent power factor. Energy may be furnished to this mill from either of two stations, namely at Polo, 13 miles away, or at Dixon, 23 miles away. The line from Polo is built of No. 6 copper and is operated at 13,200 volts. Twelve miles of the line from Dixon is built of No. 2 copper and 11 miles of No. 6 copper. This line is also operated at 13,200 volts. To satisfactorily carry the heavy low power factor load over the No. 6 wire, would have been practically impossible had it not been for the equipment in an old and inefficient combination steam and water-power plant at Oregon.

The main machine in the old station was a 300-kw. synchronous generator arranged so that it could be connected by means of a clutch to either a steam engine or a water wheel, or could be disconnected from both. The present practice of the company is to connect this machine to one of its prime movers, synchronize it with the line, then disconnect it from its prime mover, and allow it to operate without load as a synchronous motor to correct the line power factor. A Tirrill regulator automatically causes over-excitation of the field of the synchronous machine so that it exerts the proper corrective effects by balancing the reactive current due to the inductive load.

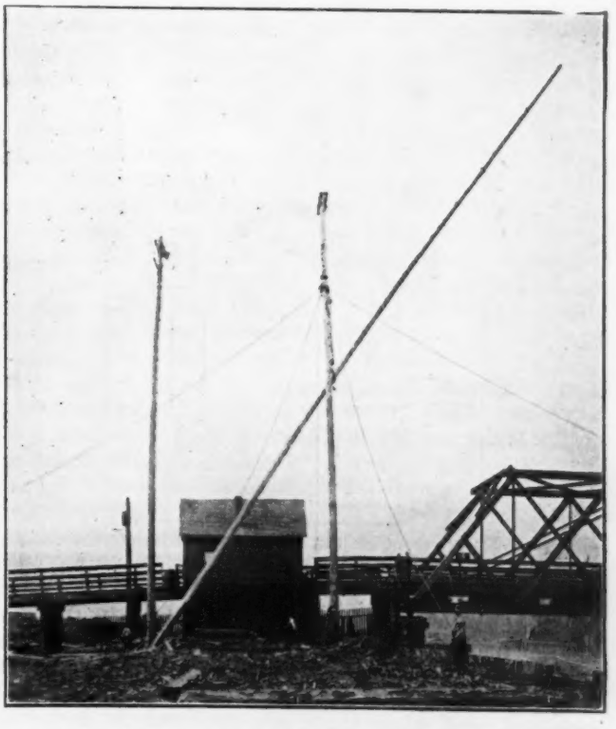
Had this application of the synchronous condenser principle not been made it would have been necessary to increase the line voltage from 13,200 to 33,000 volts and consequently reinsulate for the higher voltage, in order to keep the line regulation within reasonable limits.

Tall Poles for River Crossing Span

BY K. C. SCHLUSS

When the Puget Sound Traction, Light & Power Company recently extended its 13,000-volt, three-phase system to serve several large consumers on the Tide Flats of Tacoma, Wash., it was necessary to cross the Puyallup River, which is a navigable stream. The government specifications for crossing spans call for a clearance of 100 ft. above maximum high water. In order to obtain this clearance in the center of the span, which is 230 ft. long, it was found that the poles supporting the crossing span would have to be 125 ft. long.

Although the Puget Sound country has become famous for its long, straight cedar poles—no cedar poles of this extreme length could be found. It was finally found necessary to use fir poles. Two well-proportioned poles were located and loaded on three 41-ft. flat cars. Fortunately, track facilities were available so that these



ERECTING A 125-FT. FIR POLE FOR A 230-FT. RIVER CROSSING SPAN

long poles could be moved on the cars within several hundred feet of the crossing.

As delay was experienced in obtaining the poles, a temporary crossing had been constructed using 75-ft. poles and these were used to good advantage as gin poles in raising the permanent poles. No difficulty was encountered in raising the 125-ft. sticks, the time consumed from starting to raise each pole until same was set and tamped in being two and one-half hours.

One customer who is served from this line has replaced steam power by motor drives in his door factory where sufficient refuse is available for fuel and where steam is still required for dry kilns and for a sawmill. This plant has a capacity of from 2000 to 2500 doors per working day of twenty hours, absolute continuity of service and perfect speed regulation being imperative. The average maximum demand of this plant is 300 kw. and the monthly load factor between 70 and 75 per cent.

SCHEMES FOR MINIMIZING SERVICE INTERRUPTIONS

Relay Arrangements for Clearing Short-Circuits by Interrupting Generator Field Currents, Also Provisions for Pulling Machines in Step After Interruption

A method of clearing short-circuits which involves interrupting the field current of all generators momentarily (say one or two seconds) and then restoring it again was described by F. E. Ricketts at the recent Cleveland convention of the A. I. E. E. By this method the voltage of the system may be quickly brought to zero, since the heavy armature current will tend to demagnetize the field even before their circuits are opened. By the time the fields close the arc will usually have ceased, and as the current builds up in the fields the armature voltage will rise gradually from zero to normal, service on the system being simultaneously restored since machines will not have had time to come to a

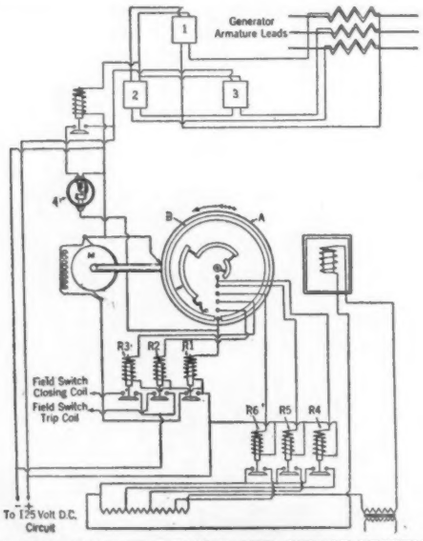
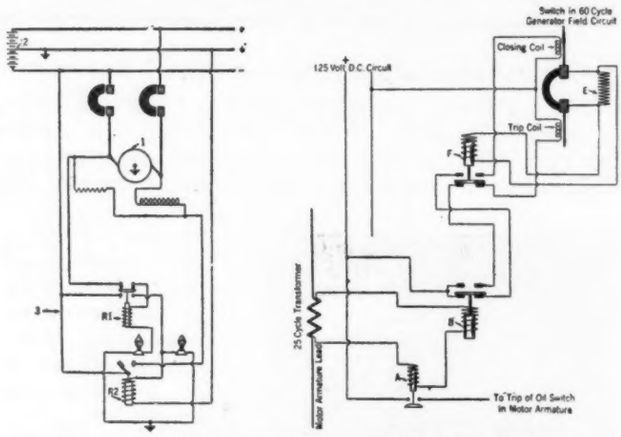


FIG. 1—CONNECTIONS OF RELAYS AND MOTOR-DRIVEN CONTACT WHEEL FOR CLEARING SHORT-CIRCUITS BY MOMENTARILY INTERRUPTING AND RESTORING GENERATOR FIELD CURRENT

"dead" stop. Voltage surges are avoided in this way, and the armature current limited to 200 per cent of normal. To insure the restoration of servce on the system, however, special arrangements of relays should be provided, and when there are synchronous motors on the line special features should be incorporated in their design.

One type of mechanism for interrupting and restoring the generator field current as used by the Consolidated Gas, Electric Light & Power Company of Baltimore is illustrated herewith. It consists of a contactor wheel mounted on the shaft of a motor which is so controlled by relays that it will rotate the wheel at least one revolution, requiring one minute, when a severe short-circuit occurs on the system. The motor



FIGS. 2 AND 3—ARRANGEMENTS OF RELAYS FOR INSURING CORRECT FIELD POLARITY ON SYNCHRONOUS CONVERTER AFTER SERVICE INTERRUPTION AND FOR REDUCING LOAD ON SYNCHRONOUS MOTOR-GENERATOR WHILE STARTING

is set in operation in response to the closing of the relays 1, 2 or 3, which are connected to current transformers, in the armature leads of at least one generator that is operating on the system. The action of the relays to start the motor is delayed, however, by a definite time-limit relay, 4, to permit selective relays on the system to cut out any minor circuit on which short-circuits may exist. If this does not clear the trouble the contact wheel starts to rotate, first closing relay *R*1, which maintains the motor in operation until the wheel has made one complete revolution. Immediately after *R*1 closes another contact closes *R*2, which trips the field switches. About two seconds later still another contact closes relay *R*3, which restores the field current. While the fields are opened the voltage regulator will boost the exciter voltage to a maximum so that when the fields are closed the field current will build up rapidly. This is desirable because the time required for generators to pull in step varies inversely as the strength of the field currents. To prevent the voltage rising too rapidly after the machines are in synchronism, relays *R*4, *R*5 and *R*6 are controlled by the contact wheel so they will insert the resistance in series with the voltage-regulating coil of the voltage regulator gradually. Thus the voltage will be restored uniformly, which is an aid in pulling the motors on the system into synchronism.

To insure bringing synchronous converters on the system back into normal operation the arrangement of relays shown in Fig. 2 can be used. With the fields connected as shown the fields are bound to build up with the correct polarity each time. When the system voltage is momentarily interrupted, the converter will draw so much current from the battery that the circuit breakers will open. Then the relay *R*1 will close *R*2, which permits current to flow from the ground through the transformers to the armature and thence through the field coils and rheostat in multiple to the negative bus, thus impressing half normal voltage of the proper polarity on the fields. Less than normal excitation is advisable while the converter is pulling into step, otherwise flashing at the brushes may occur. In most cases, 25 per cent normal will insure the correct polarity. Where no battery is used on the bus a small battery capable of furnishing the field current should be connected be-

tween the neutral and wire marked 3, which should then not be connected to the negative bus.

With synchronous motors the problem is more difficult, since they lose a part of their torque when they are out of synchronism. In this case, it is necessary to reduce the load sufficiently to permit their pulling into step. One method of accomplishing this with a motor generator set is shown in Fig. 3. When the voltage on the system builds up after an interruption relay *B* will trip the field switch before *A* can act, owing to the latter's having inverse-time characteristics. Thus resistance *E* is inserted in the field circuit, thereby limiting the load and permitting the motor to pull in step. In response to voltage across *E*, relay *F* will operate, closing the field switch. Providing pole dampers and enough reactance in the motor circuit to make the total about 20 to 25 per cent will also improve the starting torque of synchronous motors.

Horn Signal Prevents Confusion with Bells

So many bell signals are used in the Binghamton (N. Y.) Light, Heat & Power Company's station that alternating-current signal horns have been adopted in several cases to prevent confusion. One purpose for which they are used is to indicate the opening of oil switches. The horns are operated from a 110-volt circuit. A snap switch is connected in one leg of the circuit to permit cutting the horn out. In the other leg is the pallet switch of the oil switch.

A 400-kw. Rotary Substation for Operation of One-Car Trolley Line

The accompanying illustrations show equipment and construction of a small substation at Percy Station, Miss., operated by the Memphis (Tenn.) Street Railway Company in connection with its one-car line between Lake View, Miss., and the center of Memphis, a distance of 10.3 miles. Energy is purchased from the

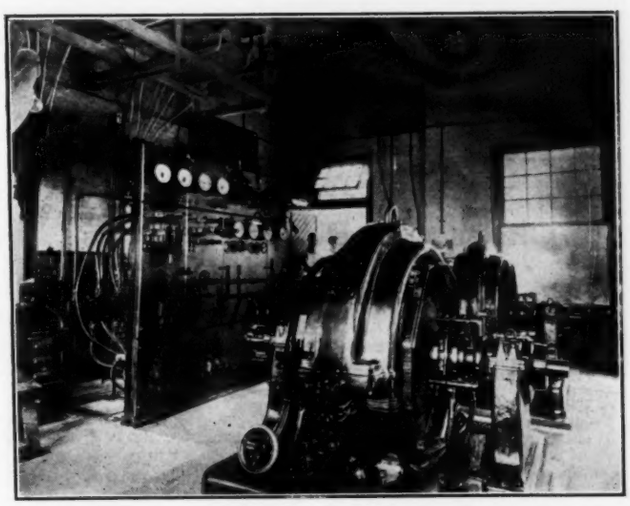


FIG. 1—TWO 75-KW. ROTARY CONVERTERS AND SWITCHBOARD IN PERCY STATION, MISS., SUBSTATION

Memphis Consolidated Gas & Electric Company and stepped down at the substation from 6600 volts to 380 volts by two sets of 75 kva., three-phase, 60-cycle, distributing transformers. The substation contains two 200-kw., self-starting, compound-wound, three-phase, 60-cycle, 1200-r.p.m. Westinghouse rotary converters for 600-volt direct-current operation. Only one converter is in operation at a time, the other being held in reserve. A four-panel switchboard contains the usual equipment of switching apparatus and instruments, all of Westinghouse Electric & Manufacturing Company's design.

The average load on the substation is from 60 to 75 kw. The total energy consumption per month is ap-

FIG. 2—SUBSTATION AT PERCY STATION, MISS., FOR OPERATION OF ONE-CAR TROLLEY LINE

proximately 32,000 kw-hr. While the substation is larger than at present required, it was designed and installed with regard to the future growth of the line. The car operated on this line has a speed of about 22 miles per hour and makes the trip one way in thirty minutes, including time for an average of six stops.

Method of Constructing Manholes in Quicksand

Occasionally manholes must be built in sandy soil where the permanent water level is only 2 or 3 ft. below the surface. In such cases they have been constructed successfully, according to the last report of the N. E. L. A. underground construction committee, by means of a modified open-caisson method. The excavation to quicksand is made in the usual manner. Then a wooden framework having the same horizontal section as the desired manhole is built up of 2-in. planks until the walls are 6 in. thick, the corners being so fastened that diagonal bracing is not needed. With this placed over the spot where the manhole is desired a casing of brick is built up to the required height and thickness of the manhole walls. The latter are plastered on the outside. After allowing the mortar to set for three or four days excavation is started inside the framework, the brick walls and framework being allowed to settle simultaneously, by undermining the walls. If the settlement is slow it may be accelerated by placing bags of sand or other weights on top of the manhole walls. Only enough water should be removed during excavation to permit the men to work, otherwise the sand will become very hard. Ordinarily only eight to ten hours will be required to sink the manhole walls unless obstructions are encountered. When the desired depth has been reached the walls are back filled and the earth tamped. Then the water is removed from the manhole and a heavy concrete floor laid. The openings for conduit are cut in the manhole after it is entirely completed. With this method of construction the labor cost is about double that for building manholes in the ordinary manner. The wooden framework is the only other additional expense.

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

A CUSTOMER'S METER CARD

A Suggestion to Encourage the Householder to Check His Meter Readings and to Insist on Better Lamps and Better Light

BY H. V. COFFY

Many central-station companies hang meter-reading cards alongside their customers' meters for the purpose of keeping a record on customers' premises of the monthly readings made by the company's meter readers. I believe, however, that there are some possibilities of a card of this sort which have been overlooked. Why not use the means presented for a little direct publicity of the right kind? Certainly some time during the year the customer himself, or one of his family, will stop to observe the meter-reading card, possibly for the purpose of comparing the reading with the last one shown on the card.

The subject of educating customers to an understanding of how to read meters has had a great deal of attention and some efforts have been made along this line. In the attached draft of a card the writer has attempted not only to teach the customer how to read his meter, but has endeavored to arouse the householder's interest to the point where he will watch the mechanism and jot down his readings each month, a process which undoubtedly will result in clearing up some of the misunderstandings that are entertained by the public regarding electric meters.

EDUCATING THE PUBLIC IN THE USE OF MORE AND BETTER ILLUMINATION

There is a further object in the card, *i.e.*, to educate the public to the use of more light and better light. The lower part of the card is devoted to this purpose. In spite of the great amount of advertising matter and sales effort which has been expended in educating the public to the value of tungsten lamps there are millions of carbon lamps still in use. It is also true, as the reader will agree, that many customers use their lamps beyond the period of their greatest efficiency, that is, after they have become blackened and are almost worthless from the standpoint of lamp efficiency. The post-card attached to the card is intended, of course, for the convenience of the customer in getting in touch with the dealer or company when he is in need of new lamps and serves as a timely reminder.

OBVERSE OF DETACHABLE POST CARD AT BOTTOM OF METER CARD

Date.....1916

Name of Company
Street Address
City
Gentlemen:

Please send a salesman to explain the superiority and economy of Tungsten electric lamps.

I am in need of

.....25-watt lamps.
.....40-watt lamps.
.....60-watt lamps.
.....larger lamps.

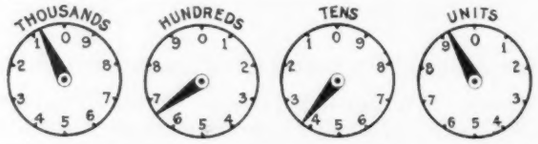
.....
Customer's Name
.....
Street Address

Help Us to Serve You Better

If each one of our customers would check his meter reading each month and telephone us if it does not agree with ours, the few mistakes made by our careful meter-readers would be eliminated.

The better service thus rendered would be of mutual benefit, and with this end in view we submit this chart and explanation of how to read your meter.

As an example, suppose the hands on the several dials stood as indicated in this diagram:



Write the figures down from left to right as they appear on the dials, always using the smaller of the two numbers between which each hand lies. Thus, the reading above is 1-6-3-9—1639. The last figure would be 9 and not 0, because as soon as the hand on that dial reaches 0, the hand on the "tens" dial would stand at 4 and the reading would be 1640.

A very little practice will enable you to read your meter correctly. If you will then write down each month in the space below provided, the meter reading as observed by you, a check will be had upon our system which will eliminate the possibility of meter-reading errors. You should endeavor to make your reading at as nearly the same date each month as that made by our meter man, for a difference of a day or more, naturally might account for a considerable discrepancy in the meter reading.

Date, 1916	Company's Reading	Customer's Reading	Date, 1916	Company's Reading	Customer's Reading
Jan. ..			July ..		
Feb. ..			Aug. ..		
Mar. ..			Sept. ..		
April ..			Oct. ..		
May ..			Nov. ..		
June ..			Dec. ..		

If your reading does not correspond with that indicated by our meter man, telephone.....and we will gladly send a representative to make correction.

Name of Company
Street Address

Are You Getting Full Light Value Out of Your Electric Service?

There are many kinds of electric lamps—but there is one kind which is better than all others—*The Tungsten electric lamp.*

Tungsten electric lamps give more light, better light and last longer than the old-style carbon lamps. Tungsten lamps cost slightly more to purchase, but soon pay for themselves in their saving of electricity.

To be sure of getting the right kind of electric lamps simply fill out the reverse side with your name and address and approximately the number and sizes of lamps wanted and we will send a salesman who will show you the *highest grade Tungsten lamps at reasonable prices—the kind that give the most light for the least money.*

If you prefer, telephone.....and say, "Send a lamp salesman."

Private Post Card

Place one cent stamp here

To get the best lamps at lowest prices—the most light for the least money—tear off this post card, fill out the other side and drop it in a mail box.

Name of Company
Street Address
Telephone.....
(Over)

Name of Company,
Street Address
City

Rates and Collections in Service to Rural Customers in Iowa

Before the recent convention of the Iowa Section of the N. E. L. A., W. H. Burtis and F. D. Paine presented an analysis of the rural lighting and power service to farm customers being furnished from the transmission lines of Iowa central-station companies. An abstract of this material was presented in these columns, page 221, July 29, the data being taken from reports furnished by 52 operating companies.

On the subject of rates, only twenty-seven companies sent in data. Of these, all but two make the same charge per kw.-hr. for rural service as city service, and these two sell the energy at a lower rate per kw.-hr. It is surprising to note that seventeen of the twenty-seven companies make the same minimum charge for rural service as for city service. Four of the remaining ten have a $5 minimum, three have a $3 minimum, and one a $1.75 minimum. Probably a large percentage of the above seventeen companies give service from their 2200-volt lines extended into the country, and hence believe that they should give the same rate. These companies fail to take into account the difference in the investment and losses per customer between city and rural service. In most cases where the farmer uses power and has the same lighting minimum as the city customer, a higher minimum is charged for power service, which is measured on a separate meter. Where the minimum charge is higher than the city minimum, one meter is generally used for both lighting and power service. Out of twenty-four companies which reported on methods of collecting all but three stated that they were making monthly collections from rural customers. These three make quarterly collections.

Useful Souvenirs for the Customer

John A. Cavanaugh, superintendent of light and power for the Benton Harbor-St. Joseph (Mich.) Railway & Light Company, does not believe in gratuitously distributing calendars and similar souvenirs to customers. While other business interests in St. Joseph carry out this practice each year, the electric company generally gives away an inexpensive yet practical and useful household utensil. Three years ago the gifts to the company's patrons and prospective customers were pancake turners, which cost the company 6 cents each. The following year 11-cent spatulas were given, and this year pan-scrapers, costing 4 cents each, are being distributed. Each device given away bears the company's standard advertising slogan, "Is Your House Wired—Benton Harbor-St. Joseph Railway & Light Company—Ask the Man." These reminders are usually distributed by a special representative, who goes from house to house.

The Central Station to the Rescue of a $25,000 Stock of Storage Eggs

The saving of $25,000 worth of cold-storage eggs by the emergency department of the central station is a pretty good talking point for central-station service.

David E. Nims, power engineer for the Central Hudson Gas & Electric Company, Poughkeepsie, N. Y., reports that on Sunday, July 16, at 10.30 a. m., his company received a hurried telephone call from the manager of a large cold storage plant that the latter's gas engine had broken down and that the cold-storage firm was accordingly in danger of losing $25,000 worth of eggs. The cold-storage management was in dire need of help, and wanted to know what could be done.

Fortunately, the plant was in a location where there was underground service, but no wires entered the building. Despite the short notice and the fact that it was Sunday, Mr. Nims immediately got the emergency gang on the job and had the gas engine torn out and a 40-hp. electric motor installed and running before dark the same day—within eight hours of the receipt of the first call for help.

Such service by the central station to its community, points out Mr. Nims, is not only appreciated, but promotes the good will of the community and makes for the best kind of advertising the central station can get.

Wiring and Illumination

Latest Practice in the Electrical Contracting Field and in the Art of Interior and Exterior Illumination

Wiring for Electric Heating Appliances—II*

BY TERRELL CROFT

Where portable heaters are installed in industrial plants special circuits, such as are shown at *A* and *B*, Fig. 3, should be used. The circuits should be subdivided and controlled with double-pole switches (S_A and S_B) so that all of the devices in an entire depart-

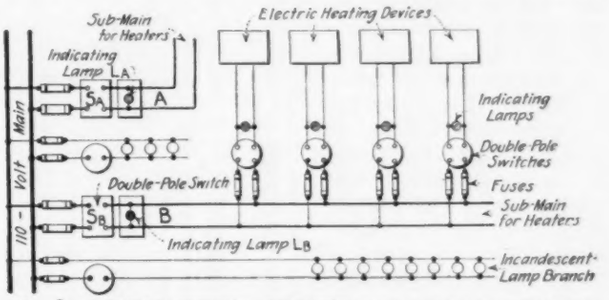


FIG. 3—SPECIAL WIRING CIRCUITS FOR ELECTRIC HEATING APPLIANCES

ment or a certain group of devices can be positively disconnected when the department is not in operation. In this way the branch circuits to the devices will not be "alive" when the operators are not present. Red pilot lamps (L_A and L_B) should be associated with the main control switch for each group, even though each individual heater in the group has its own pilot lamp and

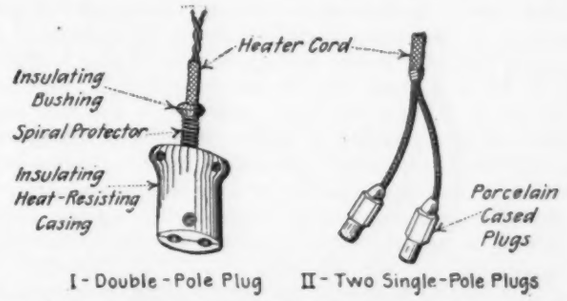


FIG. 4—PLUG CONNECTORS FOR PORTABLE HEATING DEVICES

switch (which should be located within sight of the heater) so that there will be little likelihood of the group control switch being left closed accidentally. It is frequently desirable to install special heating-device

*Continued from p. 233, ELECTRICAL WORLD, July 29, 1916.

circuits in residences, particularly when it is probable that several heaters may be used in the same building.

Flexible cords for heating devices, where the device requires over 250 watts, must be composed of rubber-insulated conductors which are protected from heat and abrasion by an asbestos serving and an outer reinforcing covering of cotton braid or similar material. For devices of less than 250 watts the ordinary reinforced lamp cord may be used.

Plug connectors are inserted in cords serving portable heating devices, usually in the end of the cord adjacent to the heater, Fig. 2, so that positive means of disconnecting the device will be available whether or not there is a switch in the circuit. Such plug connectors are particularly necessary for devices requiring less than 660 watts, because such devices may be served from a lighting circuit through a keyless socket or possibly through a key socket located out of reach.

Non-combustible stands should be provided for electric irons. Fires have been started through the carelessness of operators in leaving energized electric irons on wooden ironing boards. It has been found that the ironing surface of an electrically heated iron should operate at a temperature in the neighborhood of 500 deg. Fahr. if it is to be used for ironing damp cloth. Automatic cut-outs arranged for mounting on electric irons have been designed. The function of such cut-outs is to disconnect the iron from its source of emf. if its temperature exceeds a certain permissible value. Some such cut-outs have, however, proved unreliable in practice, and the general attitude appears to be that these cut-outs tend to increase the fire hazard rather than to reduce it.

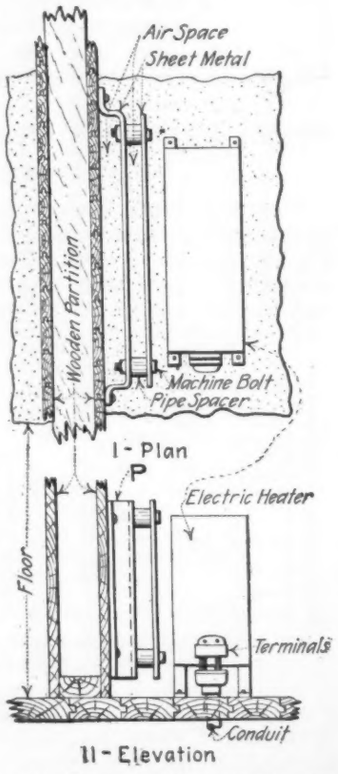


FIG. 5—AIR-SPACE SCREEN FOR PROTECTING COMBUSTIBLE MATERIAL FROM EXCESSIVE HEAT

While an indicating lamp is not required for an electric iron or other ordinary heating device, if controlled by an indicating switch it is considered good practice, and is undoubtedly desirable, to include an indicating lamp in every installation as shown. Heater control combinations, such as shown in Fig. 2 (page 232, ELECTRICAL WORLD, July 29), and Fig. 6, are now manufactured in a number of different designs which renders it uneconomical to assemble a heater control combination unless it happens that one of the specially designed combinations is not available. The spring shown in Fig. 2 is usually included in the electric iron outfits as furnished by the manufacturers. The function of this spring, which should be very yielding, is to hold the heater cord up out of the way and prevent its dragging over the material being ironed.

Protection for stationary heaters may be provided somewhat as shown in Fig. 5. A shield, composed of two sheets of steel, is interposed between the electric heater and the combustible surface near it. Note that an air space of at least 1 in. between plates should be provided. The plates should be so arranged that there may be a free vertical circulation of air between them —that is, with the construction shown in Fig. 5, the inner plate, *P*, should not extend entirely to the floor.

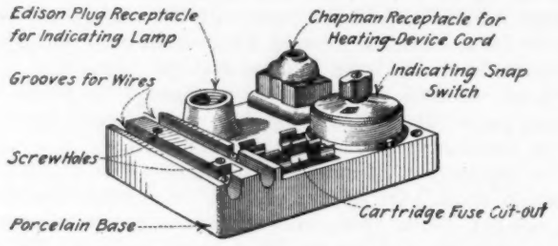


FIG. 6—AN APPROVED HEATER CONTROL COMBINATION FOR SURFACE WIRING

Frequently, alternate laminae of sheet steel and asbestos, with air spaces between them, can be utilized to advantage in providing protection of this character.

Projector Lamps Exposed to Attract Public's Attention to Sign Lighted

When illuminating outdoor advertising and signs by projector lamps it is customary to conceal the light sources, in order to avoid distracting glare. There may be, however, conditions when it is desirable to leave the light source exposed.

Such a condition is illustrated at Gary, Ind., where flood-lighting projectors are being used to illuminate a sign 20 ft. by 40 ft., painted on the side wall of a building. Ample illumination could have been secured by the use of concealed lamps close up to the building, as on many street signs, but there was here the additional purpose of attracting the attention of persons passing down the street away from the sign. Flood-lighting reflectors were, therefore, mounted on the roof of a building 75 ft. north of the sign, the vacant space between the two buildings making this possible. Persons passing along the street in the direction of the projectors cannot avoid noticing the powerful lights in the unusual position, invariably turn to see what the beams

THE PROJECTOR LAMPS ON THE ROOF OF THE BUILDING AT THE LEFT OF THE PICTURE, DIRECT ATTENTION TO THE SIGN WHICH THEY LIGHT, ON THE WALL OF STRUCTURE AT RIGHT

are directed against, and so the illumination attracts the notice of those approaching the sign and also those passing away from it.

Each of the three projectors is equipped with a 250-watt nitrogen-filled lamp.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

COMPLEX QUANTITIES IN ALTERNATING-CURRENT THEORY

A New Polar Form for Representing Complex Quantities and Its Application to the Calculation of Alternating-Current Phenomena

Chiefly through the work of Charles Proteus Steinmetz the use of the notation of complex quantities has become very popular, and deservedly so, for the calculation of alternating-current phenomena. Thus when an e.m.f. is written $a + j\,b$ it indicates that it is the resultant of two components a and b with a phase difference of 90 deg. between each other. This may be called the "rectangular form" of notation. But this e.m.f. may just as well be written $E\ (\cos x + j \sin x)$ where $E^2 = a^2 + b^2$ and $b/a = \tan x$. This may be called the "polar form" of notation. This leads directly to a third form of notation, the "exponential form," the e.m.f. being written Ee^{jx}.

In an interesting paper, presented at the Cleveland meeting of the American Institute of Electrical Engineers, N. S. DIAMANT describes a new and rather simple polar method. It is essentially based on the use of the operator j^n where n, contrary to ordinary usage, may be any positive or negative fraction.

Just as j or j^1 indicates rotation through 90 x 1 deg. and j^3 indicates rotation through 90 x 3 deg., so $j^{\frac{1}{2}}$ is interpreted as rotation through 90 x $\frac{1}{2}$ = 45 deg. In general Aj^x $(x>0)$ may be interpreted as rotation of the number A through 90 x x deg. or $\pi x/2$ radians in the positive or counterclock wise direction; similarily Aj^{-x} $(x>0)$ represents a vector which has been turned through $\pi x/2$ radians in the negative direction. Thus the exponent of j may be any number, and it indicates the phase relation of the quantity under consideration. For instance, an e.m.f. of E volts and 60 deg. out of phase with the current will be represented according to the above, as $E\ j^{\frac{2}{3}}$ where $x = (60/90) = 2/3$ and the current as $I\ j^0 = I$, since j to the zero power is unity, just as for any other algebraic quantity.

Hence our e.m.f., which in the rectangular form of rotation was written $a + j\,b$ or $E\ (\cos x + j \sin x)$ in the usual polar form or Ee^{jx} in the exponential form, becomes $Ej^{2x/\pi}$ in the Diamant notation. If the angle x is given in degrees instead of fractions of π the notation becomes $Ej^{x/90}$.

The Diamant notation has various advantages. Multiplication and division of vectors are, of course, very simple. The paper also gives the rules for addition and subtraction, for calculating the power, for determining the logarithm of Aj^n, and for differentiation. A number of problems are solved in the paper, using the four different methods of notation side by side for the sake of comparison as to their relative convenience.

"The choice of mathematical methods and notation is necessarily to a certain extent influenced by personal tastes, and it is not practicable to give any general rules as to when the notation given herein, either by itself or in combination with others, will prove most advantageous. At present some engineers prefer to use trigonometric methods entirely, while others employ complex quantities almost exclusively; still others use either of these methods or exponentials and hyperbolic functions, etc., according to whichever they think lends itself best to the case under consideration. Although the last ones are probably in the minority, it is no doubt best to avail oneself of the peculiar advantages of the different notations so far developed. The judicious choice of either the rectangular or polar form of complex quantities and the judicious combination of the same in dealing with alternating-current problems will be found useful in the theory and calculation of alternating currents and alternating-current machinery."

Generators, Motors and Transformers

Direct-Current Machine Design.—STANLEY PARKER SMITH.—In a continuation of his serial on the design of direct-current machines, the author discusses the conversion of energy in the direct-current machine and the principles of commutation and commutating poles.—London *Electrician*, June 30, 1916.

Lamps and Lighting

Electric Lighting of Small Towns.—H. N. MUNRO.—The requirements of a small town of 5000 inhabitants are considered. The selection of suitable plant is discussed, and the results of working are estimated.—London *Electrician*, June 16, 1916.

High-Vacuum Mercury Pump.—IRVING LANGMUIR.—An illustrated description of a mercury-vapor pump acting on a similar principle as that of Gaede, but being of greater simplicity of construction and reliability and operating with extremely high speed. There is also an absence of lower limits to which the pressure may be reduced. The construction is shown herewith. A blast of mercury vapor passes upward from the heated flask *A* through the tubes *B* and *C* into the condenser *D*. Surrounding *B* is an annular space *E* connecting through *F* and the trap *G* with the vessel to be exhausted. The tube *C* is enlarged into a bulb *H* just above the upper end of the tube *B*. This enlargement is surrounded by a water condenser *J* from which the water is removed at any desired height by means of tube *K* which is connected to a water aspirator. The mercury condensing in *D* and *H* returns to the flask *A* by means of the tubes *L* and *M*. The tube *N* connects to the "rough" or "backing" pump, which should maintain a pressure considerably lower than the vapor pressure of the mercury in *A*. In this pump the mercury atoms escaping from the upper end of the tube *B* radiate out in all directions. A part of them passes up into *C*, but the larger part strikes the walls of the enlargement

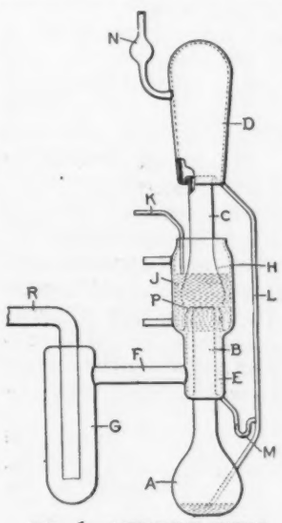


FIG. 1—MERCURY PUMP

H. If there is no water in the condenser *J* the mercury which condenses on the walls re-evaporates nearly as fast as it condenses. The molecules passing from the end of the tube *B* toward the walls *H* collide with the molecules which re-evaporate, and may then be deflected downward into the annular space *E*. This blast of mercury vapor down through *E* prevents the gas from *F* from passing up into *H*, so that under these conditions the gas from *F* may pass through the pump much more slowly than if no mercury vapor were produced in *A*. On the other hand, when cold water circulates through the condenser *J* all the mercury atoms striking the walls of *H* are condensed, so that no mercury passes down through *E*. The gas from *F* thus passes freely up through *E*, and when it meets the mercury vapor blast at *P* is blown outward and upward along the walls of the condenser *H*, and finally forced into the main stream of mercury vapor passing up through *C* into the condenser *D*.—*Phys. Rev.*, July, 1916.

Generation, Transmission and Distribution

Boiler-House Design and Operation.—W. W. Lackie.—A paper read before the (British) Municipal Electrical Association. The author deals with questions of boiler-house design and equipment, fuel handling and storage. Regarding fuel, some experiments are given on burning coke breeze or gas coke riddlings. Such fuel costs only 20 per cent of the price of coal, and has a calorific value of 60 per cent of that of coal. Even a small percentage saving in fuel is worth consideration.—London *Electrician*, June 23, 1916.

Small Generating Station.—George Wilkinson.—While a good case can be made out for the establishment of large power companies as a means for securing cheap electrical service with an economical use of coal, an equally good case on precisely the same grounds can in numerous instances be made for the small local generating station. The districts to be served are generally fairly compact areas, containing populations of from, say, 3000 to 20,000 inhabitants, with a local demand chiefly for residential supply, and a secondary but not unimportant demand for industrial purposes which develops at a slower rate. Almost without exception in such cases, the load factor will be good, but the total revenue, even when the business is largely developed, will be of such dimensions as to call for the greatest economy in capital expenditure, running costs, and especially in supervision and labor. The author prefers for this purpose a steam plant of the "locomobile" type. Plants of this type, supplying direct current at from 460 to 500 volts on the outers with accumulators, are capable in many cases of generating and supplying current to a distribution network at a cost per kilowatt-hour, which would leave little, if any, margin of profit to a power company giving a bulk supply. Some details are given of a plant of this type installed by the author at Ilkley, where the following results have been obtained:

Load Conditions and Coal per Kw.-Hr.	Cost with Coal at $5.25 Per Ton, Per Kw.-hr. Gen.
At 25 per cent overload, 2.9 lb. of coal per kilowatt-hour	0.646 cent
On full load of 130 kw., 2.24 lb. of coal per kilowatt-hour	0.50 cent
On half load, 2.61 lb. of coal per kilowatt-hour (arrived at by calculation from engine tests)	0.58 cent

The Garrett superheated steam semi-stationary engine is installed there, and an illustrated description of the same is given in a separate article.—London *Electrician*, June 16, 1916.

Traction

The Electric Vehicle in the Service of Municipalities.—W. H. L. Watson.—An illustrated article on Edison battery vehicles in municipal service in Great Britain, especially for the removal of house refuse. Results are given of the experience at Barnes, Sheffield, Nottingham, Chester, Dover and Hounslow. The number of such electric vehicles now in use in the United Kingdom is 660, compared with the comparatively insignificant total of 150 a year ago.—London *Electrician*, June 23, 1916.

Electrophysics and Magnetism

Skin Effect.—G. W. O. Howe.—A mathematical paper on the application of telephone transmission formulæ to skin-effect problems, on the basis of analogies between the two sets of phenomena.—*Journ.* (British) *Inst. Elec. Eng.*, April 1, 1916.

Constants of Radiation of a Black Body.—W. W. Coblentz.—An abstract of an American Physical Society paper in which the author gives the results of a recomputation of the constants of spectral radiation of a "black body." From a consideration of the data now available it appears that the value of the constants of spectral radiation are close to C = 14,350 micron deg., A = 2890 micron deg., and that the coefficient of total radiation is of the order of $\sigma = 5.7 \times 10^{-12}$ watt cm.$^{-2}$ deg.$^{-4}$. This indicates that the constant *h*, of the quantum theory, is of the order $h = 6.56$ to 6.57×10^{-27} erg sec., which is Millikan's latest value.—*Phys. Rev.*, June.

Electronic Theory.—Sir J. J. Thomson.—The conclusion of his series of lectures on radiation from atoms and electrons. Newton considered light as consisting of small corpuscles moving at great speeds, and after his views had been completely superseded by the undulatory theory for some centuries, the electromagnetic theory of light is now reviving to some extent Newton's conceptions.—London *Electrician*, April 28, 1916.

Emission Quanta of Characteristic X-Rays.—David L. Webster.—An account of an experimental investigation, the chief results of which are as follows: Rays of the *K* series of rhodium are produced only at potentials above that required to excite general radiation of a frequency equal to or slightly greater than that of the gamma line. Above this potential all the *K* lines increase in the same ratio for any given increase of potential; their rates of increase are continually accelerated, while that of any short interval in the general spectrum is at first retarded and then nearly constant. The value of Planck's *h* appears to be 6.53×10^{-27} erg sec., taking *e* as 4.774×10^{-10} esu. In the discussion of these results it is assumed that X-rays must obey the laws of the classical electromagnetics and that the quantum relations must be due to an ability of the oscillator to store absorbed energy in some non-radiating system such as the circulation postulated in Parson's magneton theory. On this basis it is shown that the short-wave limit of the spectrum at a constant potential indicates that even the general radiation consists of wave trains and not of pulses, and therefore that X-rays are emitted by oscillators of definite frequencies distributed throughout the spectrum; this conclusion is strengthened by evidence from the absorption spectrum. All the behavior of the *K* rays described above is explainable on an assumption suggested by the general emission and absorption spectra, namely, that the same mechanism which emits fluorescent characteristic rays also emits those which arise directly from the impact of cathode rays without true fluorescence. The quantum law for the end of the spectrum indicates that the energy of cathode particle cannot combine with that already stored to produce a quantum; this appears inconsistent with any type of atom in which the energy is stored as vibratory motion, but not necessarily with Parson's theory of the atom.—*Phys. Rev.*, June, 1916.

Electrochemistry and Batteries

Metallurgy of the Rarer Metals.—JOSEPH W. RICHARDS.—A paper read before the American Institute of Chemical Engineers dealing with possibilities of improving the metallurgy of beryllium, magnesium, calcium, strontium, barium, boron, chromium, titanium, molybdenum, zirconium, and cerium.—*Met. & Chem. Eng'ing*, July 1, 1916.

Units, Measurements and Instruments

Coefficient of Mutual Induction of Eccentric Coils.—S. BUTTERWORTH.—In certain types of variable inductances one coil moves so that its plane remains parallel to, and at a constant distance from, the plane of a fixed coil. By this means the mutual induction between the two coils may be made to range from a considerable value to zero and then to change sign during a comparatively small motion of the coil. This use of eccentric coils lends a certain interest to the problem of determining the mutual induction between two non-coaxial circular filaments. This problem is subjected to a mathematical analysis.—*Philos. Mag.*, May, 1916.

Telegraphy, Telephony and Signals

Long-Distance Telephony.—A note on two recent British patents (12,434 and 13,769, 1915) of the Western Electric Company for loading coil construction. The coils have a core divided up by several non-magnetic gaps to prevent interference with the working of amplifiers on loaded lines due to change of inductance caused by excessive residual magnetism, and to facilitate superimposed telegraph working on loaded lines. The second specification describes a further improved construction using non-magnetic material for the conductors connecting the different sections.—London *Elec. Eng'ing*, June 15, 1916.

Telephone Transmitter.—A note on a recent British patent (13,674, 1914) of W. K. L. Dickson for a telephone transmitter, designed to obtain great purity of sound. The loosely-packed microphone material is arranged in an annular space, leaving a clear air space on both sides of the center of the diaphragm, while a specially-shaped shield protects the central part of the diaphragm from direct impingement of the sound waves. —London *Elec. Eng'ing*, June 15, 1916.

Book Reviews

THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1916. New York: Marconi Publishing Corporation. 880 pages. Illustrated. Price, $1.50.

A large amount of valuable data is assembled in this volume. A special index to the section dealing with laws and regulations of the different countries using wireless telegraphy has been included in this year's compilation, as well as the report of the committee on standardization of the Institute of Radio Engineers. Another section includes special contributions on important wireless subjects, among which are Dr. Fleming's "Photoelectric Phenomena" and Dr. Eccles "Calculation of Wave-Lengths." Dr. Marconi has contributed an essay on "Wireless Waves in the World's War." A wireless map of the world adds interest and value to the compilation.

EXPERIMENTAL WIRELESS STATIONS. Their Theory, Design, Construction and Operation. By Philip E. Edelman. Published by the author, Minneapolis, Minn. 272 pages. Ninety-eight illustrations. Price $1.50.

Intended as a guide for experimental or amateur work in radio-telegraphy, this book takes up from almost the first page the construction of wireless instruments and stations. The history of the art is omitted, and only a short chapter is devoted to "Theories of Transmission;" the balance of the work has to do with practical matters. This is perhaps the best plan, for the theoretical treatment given is decidedly weak, while many of the instruments explained should be of real use to the wireless amateur.

Of the nineteen chapters, seventeen are descriptive of aerial grounds, transmitting transformers, condensers and inductances, receiving detectors, tuners and telephones, wave meters, etc. This portion of the book appears to be practically as it appeared in the 1912 and 1914 editions, and is open to the same criticisms as to technology. Speaking generally, the instruments and arrangements shown will work reasonably well, and the book will be found full of useful suggestions for building experimental apparatus. The author's explanations of modes of adjustment and operation, however, must in many cases be disregarded if accuracy is desired.

The new edition contains a "1916 Supplement" which, in about fifty pages, discusses railroad, automobile and aeroplane wireless, the radio compass, various forms of aerials, the concept of radiation resistance, the heterodyne receiver, numerous vacuum oscillators and amplifiers, transcontinental radio-telephony and long wave telegraphy, etc., and gives a classification by number of U. S. patents on "wireless" from 1881 to 1916. The descriptions are necessarily brief, but seem to be quite closely accurate.

Detailed dimensions of a receiving tuner for waves as long as 14,000 meters are given, together with various "oscillating audion" circuits and kindred matters. The entire book needs rearrangement and thorough revision. There is in it, however, much which should interest the amateur.

EXPORTERS' ENCYCLOPEDIA, TWELFTH EDITION. New York: The Exporters' Encyclopedia Company. 1076 pages. Price, $7.50.

Full and authentic information relative to shipments in every country of the world is contained in this volume. The arrangement of the information is excellent. Under each country are given area, population, commerce, products, with brief descriptions of the predominant industries, opportunities for new industries, foreign trade, its railways and waterworks systems, points for which through bills of lading are issued, consular charges and regulations, and other valuable data. The Exporters' Encyclopedia fully justifies its title.

Books Received

THE LOCALIZATION OF FAULTS IN ELECTRIC LIGHT AND POWER MAINS. With Chapters on Insulation Testing. By F. Charles Raphael. London: The Electrician Printing & Publishing Company. 210 pages. 128 illustrations. Price, 68/6.

THEORY AND CALCULATION OF ALTERNATING CURRENT PHENOMENA. Fifth Edition. By Charles Proteus Steinmetz. New York: McGraw-Hill Book Company, Inc. 480 pages. 221 illustrations. Price, $4.

PRINCIPLES OF ELECTRICAL DESIGN. D.C. and A.C. Generators. By Alfred Still. New York: McGraw-Hill Book Company, Inc. 366 pages. 145 illustrations. Price, $3.

ELECTRIC WIRING DIAGRAMS AND SWITCHBOARDS. By Newton Harrison. With additions by Thomas Poppe. New York: The Norman W. Henley Publishing Company. 303 pages. 130 illustrations. Price, $1.50.

The Water Power Situation

To the Editor of ELECTRICAL WORLD.

SIR: The recent discussion at Washington on water power[1] development shows, I think, a lack of appreciation of the value of water powers for work at low load factors. This is brought out by Mr. Stott in these words:

> "Now what we learn from these facts is simply this—that if we want to produce power at a lower cost than we can do to-day by hydroelectric plants, we must use some combination of steam and hydroelectric power, the steam plant for the peak loads and the hydroelectric power for that part of the load having load factors of over 60 per cent. * * * That is, if we can produce steam for the average purposes for the use of those industries which involve the use of a load factor considerably below 50 per cent, why bother with hydroelectric power at all? There is no use in going into it where the load factor is below 50 per cent. There is hardly a single hydroelectric power left which it will pay to develop if the load factor is below 50 per cent."

These statements are true only in case the annual cost of the hydroelectric output is a constant sum per kw. of capacity, and consequently an increasing amount per kw.-hr. at low load factors. This condition obtains where power is sold at a fixed price per year, as at Niagara Falls, N. Y., which Mr. Stott apparently had in mind, but it is the reverse of true when the energy output of the plant is a constant, with equipment varied to suit the load factor.

The controlling condition then is that the hydroelectric plant should have sufficient storage to permit the delivery of its full quota of energy at any commercial load factor, that is, with constant energy output and not constant power. In all such cases, if the costs of energy from the hydroelectric plant and from the steam plant are equal at any load factor, then the cost of energy from the hydroelectric plant will be less than that of the steam plant at lower load factors and greater than that of the steam plant at greater load factors. I have shown this in detail in my paper before the Institute in 1914 (Transactions A. I. E. E. Vol. XXXIII); it is a very simple matter of relative costs, but as it seems to be misunderstood by such well-known authorities, it may be well to restate it.

For a hydroelectric plant, let

W = total cost for the year, operation and fixed charges.

W_1 = the annual cost of that portion of the plant which does not vary with the installed capacity.

W_2 = the annual cost of that portion of the plant which does vary with the capacity.

w = the annual cost per kw. on that portion of the plant varying with the capacity; this is made up of a certain per cent charge on an increment investment.

P = the capacity in kw.

Then

$$W = W_1 + W_2$$
$$= W_1 + wP \qquad (1)$$

Similarly for a steam plant, let

S = the total annual cost, operation and fixed charges.

S_1 = the annual operating cost, proportional to the output.

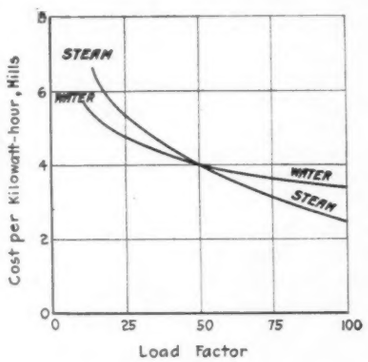
S_2 = the annual capital charges made up of a per cent rate on the total cost of the plant.

s = the annual capital charges per kw. of capacity.

Then

$$S = S_1 + S_2$$
$$= S_1 + sP \qquad (2)$$

The annual charge per kw. of increment of capacity (w), for a hydroelectric plant is always less than the annual charge per kw. of capacity of a steam plant for two reasons: first, the rate charged against it is less; and second, the capital sum is less. All authorities assign a less rate on investment to a hydroelectric plant than to a steam plant, fair figures are 10 per cent and 15 per cent, respectively, excluding profit in both cases. The difference in this rate is the greater depreciation and obsolescence of the steam plant and the increase in taxes due to the nature and location of the property. Moreover, the cost of increasing the installed capacity of a hydroelectric plant is less than the total cost of a steam plant, as $30 to $40 will cover the increment cost of a hydroelectric plant in nearly all cases, whereas for the steam plant the cost will be about $60 per kw.



RELATIVE COST OF ENERGY FROM HYDRAULIC PLANT WITH STORAGE AND A STEAM PLANT

Taking $40 for the hydroelectric plant and $60 for the steam plant, and rates of 10 per cent and 15 per cent, respectively, the costs are

$$W = W_1 + 4P \qquad (3)$$
$$S = S_1 + 9P \qquad (4)$$

Obviously if $W = S$ for any particular load factor, as 50 per cent, then W is less than S for all values of P greater than that giving 50 per cent load factor, that is, for lower load factors; and is greater than S for lower values of P, that is, for higher load factors. The disadvantage of the steam plant at low load factor is made greater by the increase in the operating cost S_1; that is, both terms of equation (4) increase at low load factors.

These facts are brought out in Fig. 1, in which the costs are shown to be equal at a 50 per cent load factor. The curve for the hydroelectric plant falls below that for the steam plant at a lower load factor, and rises above that for the steam plant at a higher load factor. The precise figures used may vary widely without affecting the general statement that water power plants with storage are relatively cheaper at low than at high load factors.

These facts can be illustrated by a specific case for which detailed costs are available. Table I gives the cost to build a large water power plant, including transmission lines and substations equipped for different load factors. The plant having adequate storage to secure the delivery of the same quantity of energy under all load factors.

TABLE I

Load Factor Per Cent	Cost to Build — Per Kw. Dollars	Per Kw. Hr. Cents	Annual Cost per Kw. Hr. Mills
25	80	3.65	4.05
50	120	2.75	3.15
100	200	2.28	2.68

The cost of energy increases materially at low load factor, but even so is lower than for the steam plant, for which the 15 per cent on a cost of $60 at 25 per cent load factor is itself equal to 4.15 mills, greater than the total cost of the water power, without considering the operating costs.

This all means that for such water powers the peak should be carried by the water and the base by the steam, each being then used to the greatest advantage.

One other point is conspicuous by its absence in nearly all comparisons of the cost of water and steam power, and that is the ignoring of the heavy obsolescence of steam plants. The history of steam plants in New York illustrates the point well enough. The average life of these plants has been less than ten years, the average output probably less than 2500 kw.-hr. per kw. of capacity, which means a total output of 25,000 kilowatt hours during the useful life. The cost has averaged more than $100 per kw., so here is an obsolescence charge of 4 mills per kw.-hr., which is usually blinked at. The immediate saving in coal looms large while the deferred cost of obsolescence vanishes in the distance. All improvements and increased economies in steam generation mean increase in the obsolescence cost and the possible introduction of oil engines threatens greater burdens. The stability of water powers has not been sufficiently emphasized in these discussions.

The water power with storage is becoming important, and as the conservation movement leads to this water powers operated at low load factors will increase.

CARY T. HUTCHINSON.

New York City.

[1] Proc. A. I. E. E., July, 1916.

Readers' Views and Comments

Men of the Industry

Changes in Personnel and Position—Biographical Notes

C. C. Simonson, for the past six years manager of the Lewistown plant of the Montana Power Company of Butte Mont., has been transferred to Billings, Mont., to take charge of the company's interests there.

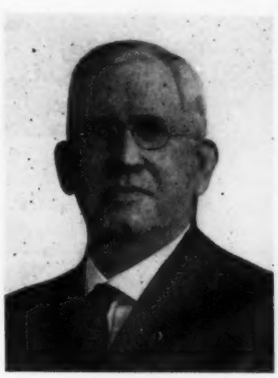
George S. Haley, formerly vice-president and general manager of the Texas Power & Light Company, Dallas, Tex., is now the executive head of the General Engineering & Management Company, 141 Broadway, New York City.

Leander Dorsay has severed his connection as superintendent of the Whiting-Turner Construction Company, to become manager of the contracting department of the Kram Engineering Company, Inc., with offices in the Maryland Casualty Building, Baltimore, Md.

A. D. Quackenbush, formerly of the engineering department of H. M. Byllesby & Company of Chicago, and for the last few years assistant superintendent of the Mobile Electric Company, Mobile, Ala., has been appointed general superintendent of the Mobile Electric Company.

Solomon Lewenberg has been nominated to the Massachusetts Gas & Electric Light Commission by Governor McCall. Mr. Lewenberg was born in Boston, Mass., in 1876, was educated at the Boston University Law School, and is prominent in the American, Massachusetts and Boston bar associations. For some years he was associated in practice with the late Judge William Schofield of Boston.

E. M. Anderson, the president-elect of the Tri-State Water & Light Association of Georgia and North and South Carolina, is the superintendent of the Abbeville (S. C.) municipal lighting plant. Born in 1866, Mr. Anderson entered the electrical field at the age of twenty as engineer for the electric light company at Charleston, S. C., resigning in 1889 to join the staff of the Westinghouse company. From 1891 to 1898 he was superintendent of the Spartanburg (S. C.) Gas & Electric Light Company, and from 1898 to 1909 he served as superintendent of the municipal plant at Union, S. C. Since 1909 Mr. Anderson has been superintendent of the Abbeville utilities property.



E. M. ANDERSON

W. B. Sedgely, manager of the Great Western Power Company for the Martinez, Cal., district, has been appointed city electrical inspector for the city of Martinez.

H. K. Shuff has been appointed manager of the Artificial Ice, Power, Heat & Light Company of Shenandoah, Neb., succeeding R. M. Pritchard, who has been transferred to the general office in Omaha, Neb.

J. L. White of Albany, Ore., as district manager in charge of the Willamette properties of the Oregon Power Company, will take up the greater portion of the work left by the resignation of Attila Norman, vice-president and general maanger.

William H. Ripley has been appointed general sales manager with the Bruston Automatic Electric Lighting & Power Company, 101 Park Avenue, New York City. Mr. Ripley was formerly general manager and engineer with the Prometheus Electric Company.

R. E. Griffiths has been appointed purchasing and claim agent of the Beaumont (Tex.) Electric Light & Power Company, Beaumont, Tex. For the last nine years Mr. Griffiths has been connected with the Northern Texas Traction Company of Fort Worth as chief clerk to the vice-president and general manager.

B. L. Martin, superintendent of lines and conduits for the Georgia Railway & Power Company of Atlanta, Ga., has retired after twenty-seven years' continuous service with the company and its predecessors. Upon his retirement Mr. Martin was presented with $200 in gold given by the officers of the company, department heads and many of the employees.

John M. Flournoy, manager of the Levy-Morton Company of Americus, Ga., has resigned to accept a position with the Stone & Webster Engineering Corporation of Boston, Mass. Mr. Flournoy will go to Ponce, Porto Rico, where he will be general superintendent of the Ponce Electric Company, which operates the lighting and street railway systems in Ponce.

Obituary

H. S. Manning, for thirteen years connected with the sales department of the Puget Sound Traction, Light & Power Company of Seattle, Wash., died at his home, 9909 Forty-fourth Avenue, South Seattle, on July 15, from an attack of spinal meningitis. Mr. Manning was a graduate of the Massachusetts Institute of Technology, and for several years was with the General Electric Company at Chicago. He was born at Salem, Mass., and was fifty-one years old at the time of his death.

Richard F. Rankine of Niagara Falls, N. Y., who aided in the organization and development of the Niagara Falls Power Company, and a well-known financial figure of western New York, died July 13 at the age of 54 years. Mr. Rankine was born in Geneva, N. Y., and was graduated from Hobart College in 1882. He became associated with his brothers, Delancy and Harold Rankine, in the organization of the Niagara Falls Power Company and was at one time treasurer of the International Traction Company of Buffalo, now known as the International Railway Company.

William Rodney Patterson, identified practically all his life with the Western Electric Company, and very largely responsible for the development and invention of present telephone cables, died at Chicago, July 19. He was born in Effingham, N. H., in 1854 and graduated from Dartmouth College in 1876. In October, 1877, he became associated with the late Enos M. Barton of the Western Electric Company, whom he survived but a few months, although a much younger man. Up to 1900 Mr. Patterson was shop superintendent, but later became plant superintendent and was largely responsible for the layout of buildings of the present Hawthorne plant. It was during his initial year with the Western Electric Company that the number of the company's employees first reached 100 and the amount of weekly payroll exceeded $1,000. As Mr. Patterson recently said of himself, during those days he kept all the shop books, including costs, assisted the bookkeeper in his city collections, and did all the laboratory work, both electrical and chemical. Mr. Patterson was directly responsible for the production of the dry-core telephone cable and the process of extruding the lead sheath, and during this period took out nearly 100 cable patents. Resigning from the Western Electric Company on Dec. 31, 1908, he entered the firm of Patterson & Davidson, consulting engineers, with whom he continued his activities until his death.

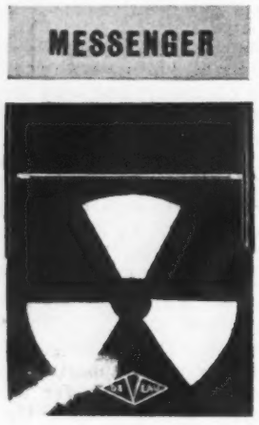
W. R. PATTERSON

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Annunciator with Electrically Reset Device

A new locking-type, electrically reset annunciator is now being manufactured and marketed by the Deveau Telephone Manufacturing Company, Brooklyn, N. Y. The drop, which is shown in the cut, has no delicate parts to get out of order, and, according to the manufacturer, will operate satisfactorily on either direct or alternating current. The visible part of the target, the manufacturer points out, is very large. The rotary target is operated by two electromagnets, one for releasing and the other for resetting. An electrically-controlled mechanical lock holds the target in either the set or reset position, thus making it impossible for vibration to affect the drop, which is entirely self-contained. Each drop is fitted with an individual removable nameplate.



TARGET OF ELECTRICALLY RESET ANNUNCIATOR

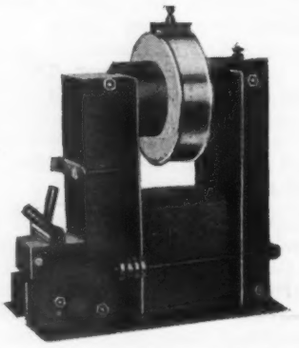
Other features of this new drop, as enumerated by its makers, are its low energy consumption, its rigid one-piece construction, its all-fiber insulation, which prevents possibility of short circuit; its non-permanent magnets, resulting in no danger of demagnetization, and its simple operation.

Transformers for Amateur Wireless Work

The Thordarson Electric Manufacturing Company, 501 South Jefferson Street, Chicago, has brought out a line of transformers in ratings of 1 kw., 0.75 kw. and 0.5 kw. for amateur wireless work. Their chief characteristics are air insulation, absence of high-tension leads or high-tension insulator, lightness in weight and adjustable magnetic shunts. They are said to operate at high efficiency with minimum vibration.

The 1-kw. unit weighs 48 lb. and is 5.75 in. wide by 11 in. long by 12 in. high. Its primary coil is designed for operation on a 110-volt, 60-cycle circuit, while the secondary coil may be made to produce potentials of from 700 volts to 20,000 volts. The internal reactance of the unit is such that even if it is short-circuited the service on the lighting circuit to which it may be connected will not be impaired. Both the secondary and the primary coil are wire-wound, the secondary coil being the one shown above, while the primary coil is located below. The terminals to the secondary winding are made of heavy brass. The high-tension terminal and the grounding post are shown at the top of the unit. An aluminum electrostatic shield entirely envelopes the high-tension coil, and, contrary to common practice, the high-tension coil is impregnated and not taped.

Two features of the device are embodied in the magnetic circuit. The permeability of the magnetic circuit has been increased by the use of saw-tooth butt joints, which bring the laminations as nearly as possible into perfect contact at the corners. At the bottom of the unit the magnetic circuit is divided so that it has two parallel legs, one passing through the center of the primary winding and the other passing beneath it. The latter is the magnetic shunt, and is provided with an adjustable air gap. By varying the width of this air gap from 0 to ½ in. the amount of flux traversing the magnetic shunt, and hence not cutting the primary coil, may be controlled to a nicety. The adjustment of the air gap is controlled by a handle which operates a ratchet on the laminated movable tongue which moves to open or close the gap. Graduations have been marked on this tongue so that the operator may set and reset the air gap to exactly the same openings without difficulty. The graduations are also useful for determining easily the amount of current taken from the line, or, in other words, the power radiated.



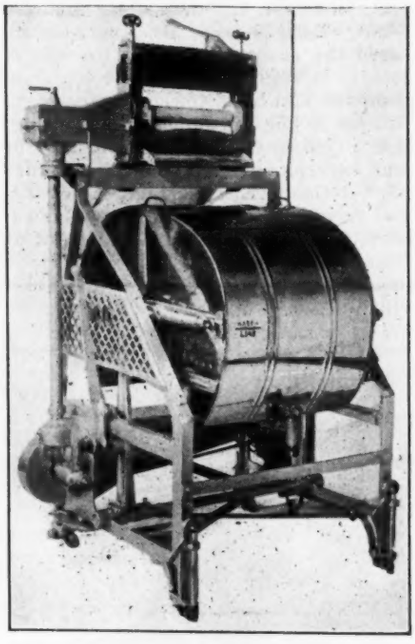
WIRELESS TRANSFORMER

It has been possible to obtain light weight in this line of transformers through the elimination of oil cooling and of all cast parts. Where cast metal was formerly used steel and brass stampings are now employed. It was only recently that the practice of using stampings in such equipment became practical, since the volume of small wireless transformer business has not hitherto justified the expense of making special tools to produce stamped parts.

Washing Machine Without Interior Tub Parts

In developing its new Cataract electric washer, the main objective of the designers of the Nineteen Hundred Washer Company, Binghamton, N. Y., has been to produce a washing tub having a maximum of efficiency without any interior moving parts.

The curves at the ends and bottom of the tub of this new washer are designed in such a manner that when the tub is given its compound motion of rocking and swinging, the contents describe a figure-eight, alternately passing over first one-half of the corrugations found in the bottom curve, and then the other half, at each half stroke. In this way the water is forced through the fabrics without the need of any



ELECTRIC WASHER WITH COMPOUND MOTION OF ROCKING AND SWINGING

The tub derives its compound motion from two swinging arms and two oscillating anchor links, on which it is mounted at four pivotal points, the two swinging arms also carrying four springs which counterbalance the weight of the tub and its contents.

For drying fabrics, the machine carries a reversible swinging wringer mounted on an upright tubular steel housing which incases the drive shaft, transmitting power to the wringer from the main gearing. The arrangement for locking the wringer against swinging is a simple split-ring clamp with screw and crank which allows the operator to locate the wringer in any desired position, holding the same without slack.

The main-drive gearing consists of a worm with a ball-thrust bearing, and a combined worm-gear and bevel-gear mounted on the crankshaft and running submerged in an oil-tight case. The bevel side of the gear transmits power to the upright wringer shaft, while the crankshaft transmits power by means of a connecting rod to the swinging arms carrying the tank.

Power is transmitted to the main gearing by a belt from the electric motor mounted on a special rocking base, with a tension spring, to allow for any shrinkage or stretch of belt.

Peanut Butter Machine

Peanut butter is a valuable and nutritious food product that is steadily growing in popularity. To enable retail food merchants to furnish it quickly and cheaply, made fresh for each customer as called for, the A. J. Deer Company, of Hornell, N. Y., is marketing the machine illustrated.

Fresh roasted, shelled, blanched peanuts of the proper size and quality are poured into the hopper of the machine, together with a small amount of salt.

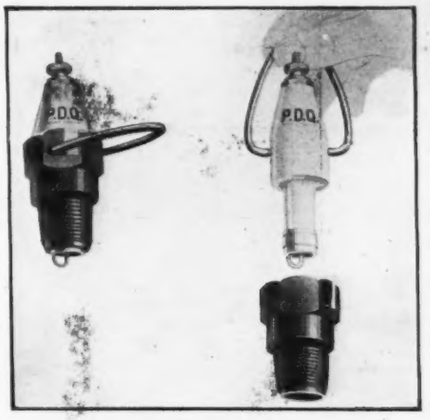
MOTOR-DRIVEN MACHINE FOR MAKING PEANUT BUTTER

The motor is then started and after the machine has attained full speed the peanuts are allowed to enter the mill, from which they emerge as a very fine grade of excellent peanut butter. The machine is furnished with a heavy duty, clutch type Westinghouse motor of 1/3 or ½ hp., according to the quantity of peanut butter to be made at one time. The normal capacity of the peanut butter machine is from thirty-five to forty-five pounds an hour.

In addition to the machine illustrated this company also markets a peanut butter attachment for use in connection with their double coffee mills, and combination coffee mills and meat choppers, attached by removing the coffee hopper or grinders, and putting on the peanut butter hopper.

Automobile Spark Plug

The P. D. Q. spark plug which is being manufactured and marketed by the Wolverine Spark Plug Company of Detroit, Mich., and shown herewith, is constructed with the insulator and the body as two distinctly separate units. The insulator can be instantly removed from the spark plug shell without the use of

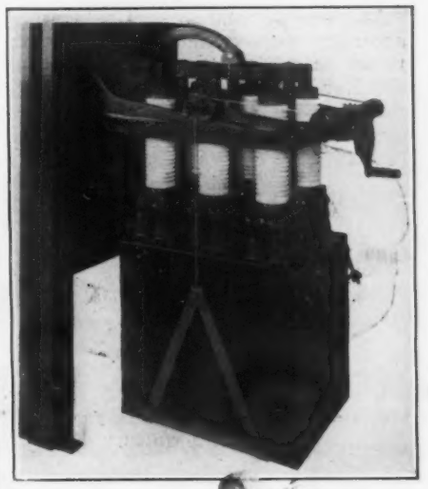


SPARK PLUG WITH BODY AND INSULATOR AS TWO DISTINCT AND SEPARATE UNITS

a tool or wrench, and the removal of the insulator from the plug body is accomplished by simply pulling up on the bail, thereby releasing the eccentric action on the shell. This allows the insulator to be rotated slightly, which enables it to be lifted out of the shell. A convex ground seat in the shell is forced with great pressure against a ground surface on the porcelain, the manufacturer points out, making the joint absolutely leak-proof. This eliminates the necessity of a gasket at the point where the insulator and body form the joint. It is claimed that in the most severe tests given the plug has failed to show a compression leak. Inasmuch as both electrodes are carried in the insulator, the plug can be cleaned easily. For priming the cylinders in cold weather it is only necessary to slip out the insulator in order to put in a few drops of gasoline for starting. This feature is especially important in connection with a car such as the Ford, where there are no priming cocks on the engine. When the plug is once installed there is never any use for a wrench and the liability of broken porcelain parts is thereby largely eliminated. These porcelain parts may be purchased separately, consequently when renewal is necessary the car owner is only obliged to buy a new porcelain part.

Tank Lifters for Medium-Sized Oil Switches

The General Electric Company, Schenectady, N. Y., has recently developed a number of tank-lifting arrangements



OIL TANK PARTLY LIF[illegible]F OIL CIRCUIT BREAKER BY TAN[illegible]TER

for oil switches of various forms and sizes. Lifters for comparatively small switches were described in the ELECTRICAL WORLD, July 10, 1915. For switches of the next larger size and in ratings up to 1500 amp. the lift herewith illustrated is employed. The oil tanks can be lifted the entire distance between the switch frame and the floor. The method of removing an oil tank is as follows: The lifter is placed on the oil switch frame and fastened there by turning two wing nuts; the operating handle, connected to a worm gear, is turned until the two triangular tank supports engage the tank, which is then unfastened from the switch frame and lowered to the floor or to any intermediate position desired. The lifter is adapted to various sizes of the form of switch shown simply by moving slightly forward or back the pulleys over which the cables run, depending upon whether the switch on which the lifter was last used is smaller or larger than the switch next to use it.

Flashing Plug

In the illustration herewith is shown a new automatic flashing plug made by

AUTOMATIC FLASHING PLUG

Kelly & Kelly, New York, and placed on the market by the Betts & Betts Corporation, 511 West Forty-second Street, New York. This "Wynk-a-lite" plug, as it is called, can be used with-

out adjustment with tungsten lamps ranging in rating from 20 watts to 60 watts and for pressures of from 50 volts to 220 volts, and therefore is called a universal device. Furthermore, the manufacturer claims that the device is not affected by temperature changes and that it is compensating. It can also be adjusted without removing from the socket.

Sturdy Electric Range

The electric range shown herewith is, according to the manufacturer, the National Electric Utilities Corporation, 103 Park Avenue, New York, designed

FIG. 1—HEAT UNIT SHOWING PORCELAIN BASE AND WIRES

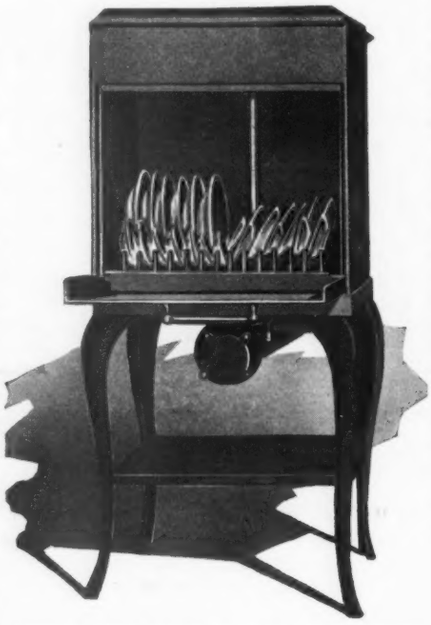
particularly for rugged, day-in-and-day-out service. The maker furthermore asserts that there is nothing in its construction to get out of order and therefore there is no danger of burnouts or short-circuits. The range is also foolproof, all resistance coils being out of harm's way and yet easy of access. The top of the range is provided with three (four where desired) 8.5-in. hot plates. The broiling compartment is equipped with a strong heating unit covering its entire area. The body of the range is of heavy double-walled, cold-rolled steel. The walls and doors of the oven and broiling compartment are lined with 2 in. of "Sil-o-cel." The

FIG. 2—ELECTRIC RANGE WITH BROILING COMPARTMENT AND OVEN

resistance wires of each heating unit are fitted securely into the grooves of a porcelain base 1 in. thick in such a manner, it is declared, that they cannot work loose or buckle. After being placed in position this porcelain base is inclosed in a cast-iron container with a highly polished top plate, 3/16 in. thick. On account of the thinness of this top plate and the small space between it and the glowing coils inside (only about ⅛ in.), the metal heats up very quickly and the top plate retains its heat long after the current is turned off. There are three heats, high, medium and low. In order to prevent loss of heat in a downward direction the bottom of the porcelain container is insulated, and the porcelain container, together with the insulating block, is inclosed in a sheet-iron case around the bottom.

Electric Dishwashing Machine

In the accompanying illustration is shown an electric dishwasher which is operated by a 1/10-hp. motor connected directly to a centrifugal pump of special design. The front door of the machine can be lowered as shown, and when in that position can be utilized

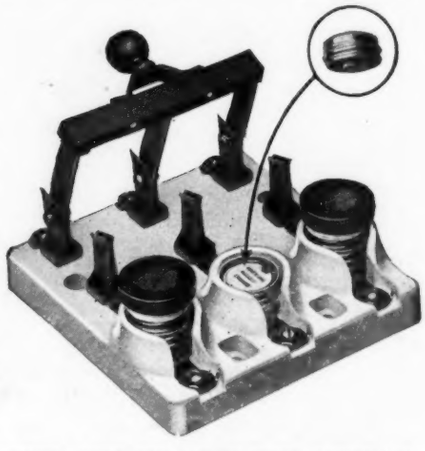


DISHWASHER WITH FRONT DOOR LOWERED

as a shelf for the basket into which the dishes are placed. Two runners are provided for the basket to slide on. The door or shelf when open is just the height of a table, so that the operator does not have to bend to place the dishes in the basket. The machine is furnished with two baskets, one for flat dishes and the other for cups, glasses and hollow ware. There is also a shelf under the machine for the accommodation of one basket while the other is being used. The centrifugal pump forces hot water over and through the dishes, thoroughly cleaning them. As soon as the dishes are washed the power is turned off and then the rinsing water is turned on. At this stage the drain is opened, allowing the washing water as well as the rinsing water to run to the sewer connection. The rack of dishes is then withdrawn, the dishes being sterilized by the scalding rinsing water and dried with a high luster. The machine is automatically cleaned by the rinsing process. The body of the machine is finished in white enamel, all trimmings being nickel-plated. It is mounted on stamped legs finished in black enamel. The dishwasher is 56 in. high, 22 in. wide and 20 in. deep. Dishes can be washed in from three to five minutes, the manufacturer states, and during the entire process it is not necessary to touch them with towels or hands. Provision is made so that the washer can be connected to both the hot-water and drainage systems. The machine is being placed on the market by the National Machine & Stamping Company, Detroit, Mich.

Short-Circuiting Plug

Rule 23-B of the 1915 National Electric Code specifies "that automatic cut-outs (fuses) must not be placed in any permanently grounded wiring, except at the last cut-out preceding the socket or other means of leading the current to its load." This means that a fuse cannot be used in the grounded wire in the entrance cut-out or in any of the intermediate cut-outs. To provide ready means for complying with this specification, the Bryant Electric Company, Bridgeport, Conn., has brought out what is known as a No. 599 short-circuiting plug, which has been approved for use under this rule when the plug is soldered to the screw shell so that the plug cannot be removed. The plug is made of a porcelain body with a copper shell threaded to fit the screw shell of the cut-out. A slot in the top of the plug permits the use of a screwdriver for turning the plug firmly into the screw shell. A projection on the base of the plug, which is similar to the contact projection on the fuse base, insures positive contact at this point. As will be noted in the illustration, a depression is provided in the porcelain and an adjacent hole is provided through the side



SHORT-CIRCUITING PLUG WITH PORCELAIN BODY

of the screw shell of the plug for conveniently soldering the plug to the screw shell. These plugs can therefore be used with almost the same convenience as the ordinary fuse plug, the manufacturer points out.

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

HYDROELECTRIC DEVELOPMENT IN IDAHO

Utah Power & Light Company Will Build Another Plant on the Bear River Below Its Present Grace Station to Develop 8000 Kw.

The Utah Power & Light Company has commenced the construction of a new hydroelectric power plant to be located on the Bear River in Idaho at Cove, about one and one-half miles below the company's present Grace plant. A force of 350 men is already on the ground and at work on the foundations, flume and dam. This number will be increased, it is said, in the near future to 450 and work on the powerhouse, dam and flume will be pushed vigorously during the summer and fall months and it is expected the station will be completed in May, 1917. This new plant will be the fourth owned by this company deriving its power from the Bear River.

The company's hydroelectric system on this waterway begins at the Bear Lake, which is used as a natural storage reservoir. A canal carries the water of the lake back into the river at those seasons of the year when the water is low. In order to augment the work of the outlet canal, the power company is now constructing an electrically-operated pumping station between Mud Lake and Bear Lake. Five electrically-driven pumping units having a capacity of 1500 second-feet will be installed at this plant, which is known as Lifton. About 200 men are now engaged in making this installation and the plans call for completion of this work early this fall. It is said that the pumps at Lifton are the largest of their kind ever manufactured.

A feature of the company's work on the Bear River is the fact that all of its development work has greatly aided the irrigation plants deriving their water from the Bear River. It was the company's work of widening and enlarging the outlet canal from Bear Lake to the Bear River, that made it possible for sufficient water to be turned out of the lake last summer to supply the irrigation demands which saved the crops in the fertile Cache valley during the season of 1915.

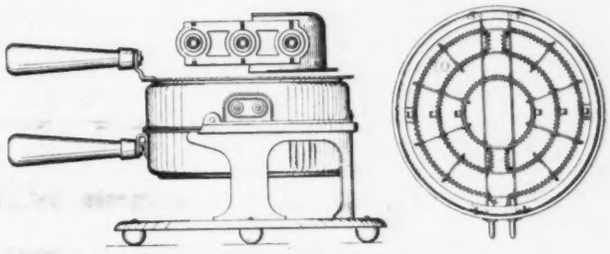
Following down the river from Bear Lake, the first hydroelectric power plant is located at Grace, sixty miles from the lake. That plant delivers 44,000 hp. to the transmission lines. A 135-mile double-circuit transmission line operated at 130,000 volts transmits this power to Salt Lake City.

The second power house on the Bear River is the new one now being erected at Cove. Here the company is now building a concrete and earth dam across the river which will be 400 ft. in length. This dam will create a reservoir just below the Grace power house. A wooden flume, 20 ft. wide by 14 ft. high with reenforced concrete framing, approximately 6000 ft. in length, will carry the water from the reservoir at Cove to the powerhouse a little over a mile below the dam. This flume will have a capacity of 1250 cu. ft. of water a second and the power plant will operate under a head of 93 ft. The power from this plant will not be delivered directly to the main transmission line, but will be carried to the outside switch yard at the Grace plant where it will be delivered to the system. The third power plant is located at Oneida, 23 miles further down the river. The Oneida station which has been completed recently delivers 27,000 hp.

The fourth plant is located in the Bear River Canyon at Whelon, this plant having a capacity of 12,300 hp. When this fourth link of the Bear River system is completed at Cove, the Utah Power & Light Company will have utilized 865 ft. of the total fall of 1710 ft. of the Bear River between Bear Lake and Great Salt Lake. This will give a utilization of slightly over 50 per cent and it is expected that ultimately practically the entire fall of the river except the small portion of it which takes place in its flat stretches will be utilized for power purposes.

Heater with Open Resistor Frame

An electric grill that embodies a resistor supporting frame of skeleton construction without embedded material is made the subject of a patent, No. 1,191,601, to J. F. Lamb. The simplicity of the device, coupled with the inclosing body which protects it from outside currents of air, should speak well for its utility. The



GRILL WITH OPEN RESISTOR FRAME

resistor consists of coiled wire supported and insulated from upper and lower converging members. From the fact that the resistor wire is not embedded, a free circulation of heated air is obtained which secures uniform heating effects.

Sale of Dubuque Utility

The Union Electric Company of Dubuque, Iowa, has been sold to the Dubuque Electric Company for $3,000,000. I. C. Elston, Jr., of the Elston-Clifford Company of Chicago, is named president of the purchasing company, and H. B. Maynard, general manager of the Waterloo Gas & Electric Company, as vice-president. Mr. Maynard will remove to Dubuque to become executive head of the new company.

The transfer, which is largely covered by a mortgage, includes the entire equipment for light, power and traction, all franchises, buildings, tracks, park resort property, etc. F. B. Stout, formerly of Dubuque, the principal owner of the Union Electric Company stock, is not interested in the new company.

The new owners have taken charge of the property, but have not as yet announced what their policy will be. It is believed the intention is to make the property the center of an important interurban system.

Public Service Commission News

Missouri Commission

The Public Service Commission has ordered the Jefferson City Light, Heat & Power Company to discontinue penalizing its patrons who fail to pay their lighting bills by the 10th of the month and to give instead an actual discount of 10 per cent for prompt payments. The commission directs the company to pay non-realty holding patrons from whom deposits are exacted 6 per cent on their deposits in place of 5 per cent, the amount now paid. The amount of the deposit was ordered reduced.

New Jersey Commission

The Board of Public Utility Commissioners has granted approval for the merging of five corporations into the Electric Company of New Jersey; these companies are: Penns Grove Electric Light, Heat & Power Company, Williamstown Electric Company, Clementon Township United Electric Improvement Company, Woodstown Ice & Cold Storage Company, and Electric Company of New Jersey. At the same time the board has approved the sale of 1575 shares of capital stock of the new organization to the American Railway Company of New Jersey. The new electric company has been granted permission to issue capital stock for $157,000 for operations and extensions.

Pennsylvania Commission

In an opinion which was made public on July 25, the Public Service Commission practically serves notice on all utilities that it does not care what the books show the stock issues to be, since in fixing rates only real values will be considered.

The Beaver Valley Water Company, against which the opinion was delivered, was the result of a series of consolidations that took in a half dozen companies. The company maintained that its plant was worth $2,598,361.94, but the commission's experts placed it as $985,000. The company asserted that a gross revenue of $175,000 a year was necessary in order to maintain its corporate existence, but the commission finds that an annual gross revenue of $135,950 is adequate.

The Valley Water Company was one of the concerns taken over. Its plant cost $115,000. The owners of the Valley corporation received $200,000 in stock of the Union Water Company, the latter assuming responsibility for $115,000 worth of bonds. The evidence in the case tends to confirm the view that the one who furnished the money for the transaction owned both companies. Finding that sort of a situation, the commission ruled that the company accountant was wrong in his view that stock transactions were equivalent to cash payments.

The company contended that an allowance should be made for the duplicate buildings and the duplicate equipment that had been rendered useless by reason of some of the consolidations. The commission held that these duplications could not be taken into account in fixing rates.

The company held that an allowance must be made for the street paving it would have to replace some time if it stayed in business and lines required repairs. Regarding this claim which was not allowed the commission said:

"Unfortunately, some utilities have sought to take advantage of the reproduction-cost method of valuation to capitalize for themselves municipal improvements remote from their own development and in which they have not participated. The penalty they pay is the inevitable reflection upon utilities as a whole."

The company claimed that by developing water power it rendered itself a $200,000 service. The commission held that it could not collect money from the people generally simply because its franchise gave it the right to use water power and therefore reduce its operating charges. The company was paid for service and not because it held a franchise in the estimation of the commission which ruled accordingly.

Illinois Commission

The State Public Utilities Commission during the past year has lent its influence and made consistent rulings tending toward a total elimination of unfairly discriminatory meter-rental charges made by the various utilities of the state. Among the smaller utilities in particular a custom has grown during the past years when utility rates were not regulated, of making an extra charge of twenty-five cents per month for each meter on a consumer's premises owned by the utility. This meter-rental charge is usually in addition to an adequate minimum monthly charge. The commission has taken the position that a meter is a portion of the equipment which should be furnished by the utility without cost to the consumer, that a charge of twenty-five cents per month is excessive to cover a reasonable return and depreciation on the meter, and that the general rates for utility service should be sufficient to provide for the fixed charges of all meters connected to the company's circuits.

In considering a recent case involving a meter-rental charge, In re Harry D. Twiss, Receiver of the Shelbyville Gas Company, the commission found sufficient extenuating circumstances to permit the utility to continue temporarily the meter-rental charge until such time as the commission could make a full investigation in the matter. In this case, the commission reaffirmed its position, taken in the case against the Homer Electric Light & Power Company. (See ELECTRICAL WORLD, March 25, 1916, page 734.)

Recently the State Public Utilities Commission suspended an electric rate of the Peoples Gas & Electric Company of Savanna, which arbitrarily fixed the determination of the maximum demand of a residential consumer at 20 kw.-hr. per month. In its opinion, the commission says, "It appears further in the aforesaid schedule that a maximum-demand rate is now in effect for general lighting service and that the maximum demand of residences is fixed at 20 kw.-hr. per month. The method of determining the maximum demand for business houses is not stated. It would seem that the residential consumers are being unfairly discriminated against, particularly the small residential consumer, who can secure no advantage of his possible long-hour use of electricity until he has taken the relatively large consumption of 20 kw-hr. per month. It would seem, moreover, that a maximum-demand form of rate, if utilized at all, should be applied upon a reasonable and scientific basis which is as fair and equitable to all users of electricity as is possible in the practical workings of this type of rate."

The State Public Utilities Commission approved an agreement between the Alton Gas & Electric Company and the Piasa Light & Power Company, wherein the former undertakes to supply the electrical energy required for municipal lighting in Alton heretofore contracted for by the Piasa Company. It appears that the latter has neither sufficient plant nor adequate equipment with which to supply adequate municipal lighting to the city of Alton.

During August, the State Public Utilities Commission of Illinois will recess. Few hearings will be conducted and such as are will be through examiners. The commission will be in session again at Springfield on Sept. 5, 1916.

High Voltage Lines in City Streets Should Be Insulated.—It is negligence for an electric light company to maintain in the streets of a city a high voltage line without having it insulated, it was held by the Supreme Court of Oklahoma (157 P 1031), in the case of Duncan Electric & Ice Company versus Chrisman.

Derrick Passing Under Transmission Lines Not Trespassing.—It was decided by the Supreme Court of Kansas (158 P 28) in a suit against the Empire District Electric Company that a requested instruction that deceased was a trespasser or at least a mere licensee of the company when he undertook to move the wires and enable the derrick he was moving to pass under them was rightly refused.

Negligence in Case of Defective Transmission System.—Where a person was killed by an electric shock received in his home as the result of an accidental contact between a high-tension wire and the electric light wire of the defendant borough, caused by the breaking of defective pins on which the wires were strung, the presumption is the borough was negligent, it was held by the Pennsylvania Supreme Court (97 A 931).

Judicial Review of Public Service Commission Decisions.—Under what conditions the courts will review a decision of a public service commission were set forth by the Supreme Court of Vermont (97 A 660). The courts have power to prevent an abuse of discretion by a commission, and to require that its powers be exercised according to law and in a manner not to injure property rights unjustly. Whether the orders of a commission deprive a party of statutory right, whether he has had a fair and adequate hearing, or whether, for any reason, the orders are contrary to law, are all justiciable questions, and if they arise in circumstances calling for equitable relief, a court of chancery will afford a remedy.

Validity of Free Service Franchise.—The provisons of an electric light and power franchise that the city receive certain free service based upon the number of subscribers, and that a list of such subscribers be filed semi-annually with the city clerk, are valid conditions and constitute part of the franchise, it was held by the Appelate Division of the Supreme Court of New York (159 N. Y. S. 439) in the case of the City of Yonkers versus the Yonkers Electric Light & Power Company. The condition in an electric light and power franchise that the company should furnish lamps at places designated by the city, the number to be based on the number of subscribers, a list of which was semi-annually to be filed with the city clerk, may be enforced by the city without designating the places for such lamps, where the company had never filed the required list of subscribers. An electric light and power company is not excused nor absolved for its failure to perform a requirement of its franchise to furnish the city free service, by reason of voluntary change of its system, which rendered the performance of such condition oppressive, if not confiscatory.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Right to String Wires Along Highways.—A telephone company that received direct from the state a franchise to use public highways for aerial lines, had a right to string wires along highway without franchise or permission from local authorities, according to the Supreme Court of New York (159 N. Y. S 625).

Forfeiture of Franchise.—An electric light franchise that was bought in good faith for valuable consideration, the full performance of which was immediately tendered, although the time for completing an electric light system, on condition of which the franchise was granted, had long passed, was held by the Supreme Court of Arizona (157 P. 228) in the case of City of Bisbee versus Bisbee Improvement Company, to have become an inviolable executed contract which the city could not forfeit.

Question of Tillage of Land Affected by Proximity to Dam.—In proceedings for condemnation of land flooded by a dam, it was held by the Supreme Court of Indiana (112 N. E. 1004) in the case of Southern Power Company versus Keane, testimony as to the method of tilling wet lands and as to the difficulty of tilling that part of farm affected by the backwater from the dam is competent on the question of damages, as showing that the moist condition of the subsoil produced on lands affected by the dam could not readily be overcome by drainage.

Responsibility for Damage Caused by Overflow.—Just what status a county has and what an individual has when a power company builds a dam causing the impounded water to overflow property and highways is discussed at length by the Supreme Court of South Carolina (88 S. E. 801) in the case of Edgefield County versus Georgia-Carolina Power Company. Since it would be a fruitless remedy, neither an indictment nor an injunction will lie where a dam built under authority of an act of the legislature not limiting its height floods the highways and it was shown that this could not have been avoided. Compensation must be paid for the flooding of private property, but where public property is flooded it does not fall within the protection of the constitution requiring compensation to be made notwithstanding legislative authorization. However, in a franchise to build a dam, a general right to condemn easements does not give a right to overflow highways without condemning or paying damages therefor. Also in the absence of authority the company building the dam is liable to the county for damages from the dam's overflowing highways or interfering with ferries.

Injuries from Damaged Line Where Company Shows Diligence.—The unexplained breaking of an insulator, which caused a highly charged wire to sag from the pole to a distance of 6 or 7 ft. from the ground, at a place remote from any public highway, and its remaining in that condition for twenty-four hours, do not prove negligence, in the face of direct, positive and undisputed testimony that reasonable care was observed in the construction, maintenance and operation of the line, it was held by the Supreme Court of Appeals of West Virginia (89 S 262), in the case of Owen versus Appalachian Power Company. In such case the presumption of negligence arising from the mere falling of the wire is overcome by direct proof of diligence. Injury, without proof of negligence, it was held, gives no right of recovery; and where it is shown by the overwhelming weight of evidence that the injury resulted from the plaintiff's negligence, or was an inevitable accident, a verdict for plaintiff cannot stand.

Distinction Between Taxes and Rent Paid for Use of City Streets.—The situation existing as to the difference between a tax and a percentage of gross revenue for franchise privileges has been somewhat cleared by the Supreme Court of Oregon (156 P. 1058) in the case of the City of Portland versus Portland Railway, Light & Power Company. The court held that under the Portland City Charter the city had no inherent power to exempt property from taxation, or to exempt an electric company from the payment of any other "license or tax or charge on the business or occupation." Under the grant of a franchise to a private corporation to erect and maintain poles and wires in a city's streets for the distribution and sale of electricity, requiring the corporation to pay to the city 2.5 per cent of the gross receipts from its business done in the city, the 2.5 per cent, was the payment of a rental for the use of the streets, rather than a "tax." Where a municipality is authorized to license occupations and businesses either from regulation or for revenue, the power cannot be used unreasonably, nor can the tax be fixed so high as to be practically confiscatory, or prohibitive of an ordinary lawful business. A corporation may be simultaneously compelled to pay an ad valorem or property tax on all property owned by it, including franchises when they are considered as property, a license or privilege tax on its business, and a fee to the state for its franchise or right to do business as a corporation. A property tax must be an ad valorem tax, because it is a direct tax on property, but there is no constitutional requirement that a business or occupation tax shall be so measured. A per cent of the gross receipts of a business may be taken as the measure of the amount to be paid for the privilege of actually transacting a business, which method of ascertaining the amount of a license tax, whether on a business or the privilege of doing business in a corporate capacity, is not necessarily a tax on the earnings.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Six Months' Tungsten Production.—The tungsten production of the United States during the first six months of 1916 exceeded the production of this or any other country in any previous twelve months. Prices were even more phenomenal than production and reached more than ten times their ordinary level. The output, it is estimated, was equivalent to about 3290 short tons of 60 per cent concentrates.

Report in Cleveland Municipal Plant Deferred. — Light Commissioner Davis of Cleveland has decided not to make public the report on the municipal plant until Nau, Rusk & Sweringen complete their audit of the business. The report of the accountants will be used in the hearing of the three-cent ordinance now before the Ohio Public Utilities Commission. Edward P. Burch of Detroit has been selected as the city's expert engineer to represent it before the Commission in the hearing.

Dunkirk Municipal Plant Not to Be Enlarged.—The board of commerce of Dunkirk, N. Y., has recommended the granting of a restricted franchise to the Niagara & Erie Power Company to furnish power to large industrial establishments rather than enlarge the municipal power plant at a cost of more than $200,00 The board points out that the power company can supply large blocks of power at a saving of 15 per cent from the cost of energy generated at the municipal plant.

Improvement in Neon Tube Manufacture.—In manufacturing neon tubes which become luminous detectors of Hertzian waves, the difficulty has been to separate the usual admixture of helium present with the neon. Separation with carbon as an absorbent at the temperature of liquid air is likewise impossible. By providing carbon electrodes in a partially exhausted tube, Georges Claude, in U. S. Patent No. 1,191,495, maintains that with continued electrical discharge a differential absorption of other gases over neon is manifested, provided the electrodes have a sufficiently large surface.

Protecting Transformers from Lightning.—In transformer work wherever high frequency effects are likely to be produced by lighting, arcing grounds, or other causes, there is a possibility that resonance may be set up in the various coils employed in electrical apparatus. These coils heretofore have been wound in such a way that no attention whatever was given to their natural periods of electrical oscillation. Thus the common method has been to make all similar parts of a winding alike, as far as possible, and to group them in the same general manner. In a patent, No. 1,190,120, by Elmer E. F. Creighton, it is proposed so to arrange the windings and the winding groups that different natural fundamental frequencies and harmonics within the necessary limits shall be obtained to provide for a greater degree of safety because of unlooked-for high frequency oscillations being impressed upon the coils.

Commission Has Sole Rate-Making Power. — M. H. Aylesworth, chairman of the Public Utilities Commission of Colorado, in discussing a decision handed down by the state Supreme Court in a passenger transfer case said "the public utilities commission is the only body existing in Colorado which has the right, authority and power to originate, change and regulate the rates and service of any and all public utility corporations in that state. The legislature has specifically delegated its power in respect to the service and rates of public utility corporations and railroads to the commission and in the commission that power stands centralized." Mr. Aylesworth was speaking as a lawyer and the legal adviser of the commission as well as in the capacity of its official head.

No Rate Increase in Ontario Because of Higher Cost of Energy.—Sir Adam Beck, in commenting upon the agreement reached for a supply of 50,000 additional horsepower from Niagara at $12 per horsepower-year, stated that the price is excessive as compared with purchases upon previous agreements. However, he said that the commission earns a large percentage of profit from certain consumers who deal directly with the provincial commission and not through any municipal body, and these earnings will offset the 33 1/3 per cent increase in such a measure that there need be no boost in the cost of power to municipalities served in the Niagara zone. The Chippewa development will be ready in three years, and there will then be an abundance of power at low rates, he said.

Engineers Lack Practicability. — In an address before the American Gas Centenary celebration J. E. Aldred, chairman of the board of directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, while acknowledging his indebtedness to the engineer said that his training is such that he lacks the element of practicality. "He works from the laboratory or from the drafting room outward, and he should be checked up by some factor coming from the other end. Only too often we find power houses designed by engineers who had never operated a power house. They do not have the requisite intelligence from the standpoint of actual operation. I have seen them build power houses that were almost impossible to operate as such. It is not that engineers are less capable of showing sense and judgment than other people, but it is because they are sent out from educational institutions without having had it properly impressed upon them through their course of training that the limiting factor must be common sense and practicality."

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 304 of this number.

Contractors to Meet in Cleveland in 1918.—The Secretary of the Cleveland Chamber of Commerce announces that the National Electrical Contractors' Association has decided to hold its 1918 convention in Cleveland.

American Association of Engineers.—The national board of directors of the American Association of Engineers has adopted a resolution as follows: "Resolved, That all applications for membership received prior to Sept. 1, 1916, be accepted (provided the applicant has the required qualifications) at the present rate of no initiation fee and $10 per annum membership dues." According to an amendment of the constitution adopted at the May convention an initiation fee of $2 shall be charged after 1000 applications have been received. It is estimated that this number will be reached before Sept. 1, 1916.

Officers of West Virginia Public Utilities Association.—At the annual convention of the West Virginia Public Utilities Association held at Parkersburg recently, the following officers were elected: President, Herbert Markle of Bluefield; first vice-president, M. M. Hetzer, Moundsville; second vice-president, Fred Paul Grosscup, Charleston; third vice-president, P. P. Crafts, Parkersburg; secretary-treasurer, W. C. Davisson, Charleston; executive committee: H. S. Newton, Huntington; W. G. Mathews, Clifton Forge, Va.; H. E. Watts, Huntington; M. A. Maxwell, Logan; John B. Garden, Wheeling; W. R. Pankey, Bluefield. The matter of selecting the time and place for the next meeting was left to the executive committee.

Empire State Gas & Electric Association.—Members of the electric production division of the Empire State Gas & Electric Association held a convention at Watertown, N. Y., July 14 and 15. The following questions were discussed at this meeting: "Ways and Means of Improving Boiler Room Economics," "Motor Driven Versus Steam Driven Auxiliaries"; "Cost Data on Treatment of Feed Water and the Effect of Soda Ash on Boiler Operation, or Upon Metal of Boilers"; "Bonus System for Firemen and Average Wage of Firemen As Compared with Other Men in Stations"; "Cleaning of Condensers"; "Method of Making Prompt Records of Daily Operation Results"; "Methods of Insuring Uniform Standard of Coal Supply, and the Steam Heating Business." The delegates went by automobile to Clayton, where they had dinner, and in the evening took a trip through the islands. The annual meeting of the association will be held Oct. 5 and 6 in New York at association headquarters.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

THE VACUUM CLEANER PATENT SITUATION

Limited Number of Licensees Manufacture Machines Under Kenney Patent Covering Stationary and Portable Cleaners

All vacuum cleaners may be said to fall into one of three classes: Stationary, portable and carpet sweeper type. The fundamental patent governing each of these is claimed to be the Kenney patent No. 847,947 granted to David T. Kenney on March 19, 1907, and now owned by the Vacuum Cleaner Company. In the case of the first two types of machines the exact status of the patent has been determined by the Supreme Court, each time in favor of the owners of the patent. A suit has now been instituted against the Bissel people to determine the validity of the patent in the carpet sweeper type of machine. All electrical cleaners come under either the stationary or portable types and therefore are governed by the claims of the patent.

As owners of the patent the Vacuum Cleaner Company has licensed a number of manufacturers of different types of machines. Following is a list of the licensees according to the types they are permitted to manufacture:

1. For all types of machines, excepting wagons:
   Domestic Vacuum Cleaner Company, Worcester, Mass.;
   United Vacuum Sweeper Company, Chicago, Ill.
2. Stationary and power portable only:
   American Radiator Company, Chicago, Ill.;
   Blaisdell Machinery Company, Bradford, Pa.;
   General Electric Company, West Lynn, Mass.;
   Hanlon & Wilson, Wilkinsburg, Pa.;
   Invincible Manufacturing Company, Pittsburgh, Pa.;
   Palm Vacuum Cleaner Company, Detroit, Mich.;
   Richmond Radiator Company, New York City, N. Y.;
   Spencer Turbine Cleaner Company, Hartford, Conn.;
   Stecker Electric & Machine Company (Eureka), Detroit, Mich.;
   B. F. Sturtevant Company, Hyde Park, Mass.;
   United Electric Company, Canton, Ohio;
   United Vacuum Appliance Company, Connersville, Ind.
3. Power portable and hand portable:
   Birtman Electric Company, Chicago, Ill.;
   Duntley Products Sales Company, Chicago, Ill.;
   The Regina Company, New York City, N. Y.;
   M. S. Wright Company (Pneuvac), Worcester, Mass.
4. Hand only, all types:
   Hugro Manufacturing Company, Warsaw, Ind.;
   National Sweeper Company, Torrington, Conn.;
   W. C. Perkins & Company, Chicago, Ill.
5. Hand only, piston type:
   Duplexo Vacuum Cleaner Company, Brooklyn, N. Y.;
   Reeves Manufacturing Company, Milford, Conn.
6. Stationary and power portable, except staged fan;
   American Rotary Valve Company, Anderson, Ind.
7. Wagons only:
   McCreery Manufacturing Company, Toledo, Ohio.

The license agreements in connection with the Kenney patent made between the Vacuum Cleaner Company and the individual manufacturers, are substantially the same in each case, excepting that some of the licenses confine the licensee to one style of machine only, while other licenses confer the right to manufacture every style of machine.

Some of these licenses are not being actively used, but as they have no minimum royalty clause, they cannot be cancelled on that account, and therefore continue to run for the life of the patent, so long as the conditions of the agreement are complied with.

A clause in the agreement stipulates that in the event of the licensee discontinuing its vacuum cleaner business, the license shall cease and terminate at the option of the licensor. There is also a provision that the license cannot be assigned by the licensee excepting to a successor to its entire vacuum cleaner business.

FALL JOBBING BUSINESS TO BE RECORD BREAKER

Conditions in Middle West Healthy and Still Better Business Expected—Fan Situation Unprecedented—Price Recessions Still Far Off

Business with the jobbers in the Middle Western States is good. No one particular product may be said to stand out as a best seller, but the general line of goods is moving at a satisfactory pace. Copper is too high to permit of new promotions on a big scale, but the constant and widespread use of material used in small extensions and betterments necessary to keep apace with the times makes conditions healthy for the seller.

This fall things will be still better. While a boom is not anticipated it is expected that the autumn months will see the jobbers of the central territory enjoying a greater volume of business than has been theirs for many years. The facts that central stations and contractors have no stocks and for the last couple of years have been buying from hand to mouth and that the public has money and is spending it freely, are looked upon as propitious for boom sales.

Those jobbers who have laid in stocks in anticipation of this condition, and most of them have, will be in a position to profit by the extraordinary demand.

The fan business this summer makes the Middle Western jobber chuckle. A few weeks ago he, like many other electrical people, believed that if hot weather did not arrive before July 4 he would have a large but unprofitable stock of fans to carry over for next year. But now the theory that only early hot weather can create good fan business has been exploded. Fans in the Central West did not begin to move out of jobbers' stocks until July 10. Before Aug. 1 there was scarcely a jobber in the entire territory that could fill a good sized fan order from stock. Jobbers who carried 2000 fans and fully expected after July 4 to see last summer's lack of activity duplicated, were sold out by July 27. This year is considered the most unusual ever witnessed in this respect.

Deliveries at the present period in general lines are good owing to the fact that the jobbers are well stocked. Shipments from the manufacturers are not so prompt, however. No trouble has as yet been experienced with freight delays.

Price recessions in the Middle Western territory are not expected for many months. While the trend of electrolytic copper is downward it is known that manufacturers have bought their raw copper up to December at 29 cents and 30 cents a pound. It is also said to be impossible now to buy as much as 1,000,000 lb. of copper for January delivery at the present market price, so the prices of the jobbers' goods, it is expected, will remain staple for some time to come.

Unfortunately, collections are somewhat slow. However, the failure of prompt payment cannot be traced to any particular class of buyers, the condition applying to central stations and contractors alike. Positive reasons for the slow collections cannot be definitely ascribed, but it has been suggested that since the Central Western States are fundamentally an agricultural region collections may be better after the fall crops begin to move.

ELECTRICAL TRADE SHOWS COMPLETE RECOVERY

Threshold of Third Year of War Shows the Industry in Better Position than Ever with Bright Prospects for Record Business

On the threshold of the third year of the European war, it seems fitting to review the more important economic changes that have taken place within the electrical trade and to show how the industry weathered the storm. Electrical manufacturers in the first half of 1914 found but a listless market and were not inclined to force buying by offering inducements. Moreover, the question of freight rates was still undecided and that was a strong factor in limiting the volume of business. Just prior to Austria's ultimatum to Serbia there were a few weeks of renewed activity and the trade began to pick up in spirits, but it was all shattered by the news of the first of August, 1914.

From that time until the end of the year there was a general depression of all business. The financial centers suspended operations; public utilities postponed purchasing and electrical manufacturers as a consequence were seriously affected. The volume of electrical business in 1914 was 15 per cent less than during the preceding twelve months, and business in almost every line suffered in comparison with that for 1913.

With the opening of the year 1915, there appeared for a while what was thought to be a return to better business. Stock exchanges opened, more orders and inquiries were received by the electrical manufacturers, but the situation was merely a flash in the pan. For a few months there was a general apathy throughout the electrical field with no break until about June, when rather definite rumors of war order contracts brought about a large number of inquiries for new apparatus, especially motors. By September, the development of a sellers' market in the electrical trade was pretty well defined. Inquiries by that time had grown into actual orders.

Each day gave added evidence of the return of prosperity and by the first of January, 1916, the electrical manufacturer was swamped with business. In this condition he still remains. Prices began to advance about November last and since then there has been a general advance all along the line. Very little of this is to be attributed to the law of supply and demand because the natural tendency in the electrical trade is for stability of price. The advance in practically every case has been occasioned by the higher costs of production. Labor has gone up 25 per cent in the electrical field; raw material has cost in some cases many hundred per cent more but on the average about 35 to 40 per cent; copper rose from the normal price of about 14 cents per pound to 31 cents.

Prices of both the electrical and other construction materials were so great that all construction not absolutely necessary has been put off until lower prices obtain. Nevertheless so great has been the demand for absolutely necessary material that the electrical factories have been working night and day.

In some lines the stoppage of competition from Europe has boomed domestic manufacture. In other lines there has been a marked increase in exports. On the whole, however, although the exports are greater in value than previously, they are below the high totals of 1913 in volume of goods, because of present high prices.

In all of this maze of buying the outstanding feature has undoubtedly been the demand for immediate delivery. Never was there such a seller's market in the history of electrical manufacture. Goods were purchased because they were wanted at once. For a few months early in 1916 delivery premiums were very common. In spite of the demand for quick delivery, however, deliveries were greatly retarded. The reasons are six-fold: Lack and poor delivery of raw materials, scarcity of labor, labor disturbances, more orders than could be handled, inability to get additional machinery and freight congestion.

As the market for electrical goods revived, credits and collections became appreciably better. For a while this factor of the electrical trade was unusually discouraging. There was so little money in circulation that it was particularly difficult to sell on strict credit terms. The situation has changed, however, and contractors and jobbers are paying bills promptly. More accounts are now being discounted than ever before. There has been a tendency, however, on the part of the jobber, the contractor and dealer to overstock because of poor deliveries and to rely on the continuance of good times. This practice has been discouraged by the credit managers.

PROHIBIT BRITISH IMPORTS

Radiators, Percolators, Grills, Toasters, Flat Irons, Etc., Fall Under New British Order

It is understood that in the opinion of the department of import restrictions the following articles fall under the classification of hardware, hollow-ware, or stoves, noted in the last week's issue of the ELECTRICAL WORLD and that in the absence of some special case for concession, they cannot be imported into Great Britain: Electric radiators, coffee percolators, table grills, toasters, teapots, domestic flat irons, boiling plates and similar articles.

Other goods scheduled as prohibited include brass caps for electric metal filament lamps, pocket flash lamp cases made of soft iron scrap, and wood grips for electric lamps.

ROLLING MILL EQUIPMENT

Recent Orders for Unusually Large Electrical Units Stand Out Prominently

One of the prominent features of buying during 1916 has been the number of orders from iron and steel rolling mills for large electrical units. The sudden rush in the demand for steel was for the most part accountable for these orders.

Conspicuous in this business has been the Westinghouse Electric & Manufacturing Company which has received numerous orders for large apparatus. From the Inland Steel Company there was obtained early in the year an order for a 15,000-hp. motor, by far the largest ever built. Hardly had this order been placed than two other steel companies ordered motors of the same large size. Orders for 8000 and 12,000-hp. motors were also received.

Quite recently the company received an order for a 7000-hp. induction motor for driving a 16-in. plate mill, and for a 4000-hp. induction motor for operating a 20-in. Merchant mill, for the Illinois Steel Company.

X-RAY BUSINESS GROWING RAPIDLY

Manufacturers Find Difficulty in Keeping Abreast of Domestic and Export Orders

Never has there been such a demand for x-ray machines and apparatus as at the present time. The manufacturers have orders far in advance of output and, while working large forces of men, are handicapped somewhat by shortages of materials. The growth of the industry is largely a healthy one induced by domestic trade although the market is somewhat inflated by foreign demand formerly handled by Germany and France. These nations are now apparently utilizing their own output in the army hospital service as indicated by the fact that orders are now coming from numerous foreign countries not heretofore sold to by American x-ray manufacturers. The larger part of the activity in this industry, however, is due to a more general use by the physicians of x-ray apparatus. Where there was formerly not more than one x-ray outfit in fifty doctors' offices, there is now one in ten. This is due partly to the natural advance of the science of medicine and realization of the usefulness of the x-ray, partly to the extension of its use to many new applications, partly to the general criticism doctors have been subjected to where x-ray had not been used in treating fractures, and partly to the fact that several States have passed laws compelling the doctors to utilize x-ray plates in fracture work. The central stations have also been working to a limited extent to place x-ray machines on their lines as it means on the average of a 10 kw. demand or more, and up to as high as 30 kw.

Manufacturing and Industrial

W. F. Jones, who was formerly an electrical engineer for the Ford Motor Company of Detroit, has been made branch manager of Valparaiso, Ind., office of the Lighthouse Electric Company, Gary, Ind.

The Betts & Betts Corporation has moved from 256 West Fifty-fifth Street, New York, to larger quarters at 511 West Forty-second Street. The company announces that a large increase in its business has necessitated the change.

Louis Zises, manufacturer of gas and electric fixtures, 1175 Broadway, Brooklyn, N. Y., announces that he has closed a contract to equip the various Woolworth stores (800 establishments) throughout the United States with electric fixtures, etc.

The Diamond Power Specialty Company of Detroit has just accepted a contract with the Ford Motor Company for equipping the boilers which are believed to be the largest in the world in its new power plant with "Diamond" soot blowers. The rated capacity of the boilers is 2400 hp. and it is planned to operate them continuously at a rating of 4000 hp.

T. J. Cope.—The firm of T. J. Cope, manufacturers of Cope's electrical underground tools and equipment, which for the past twenty-five years has been located at 3244 North Fifteenth Street, Philadelphia, has moved to more commodious quarters at 1620 Chancellor Street, Philadelphia. This change has been made necessary, it is explained, by the large increase in the business of the company.

Milwaukee Concern Sells Heating-Pad Business.—The Sun-Ray Manufacturing Company of Oshkosh, Wis., has taken over the plant, patents, etc., of the heating-pad department of the P. & B. Company of Milwaukee. The Sun-Ray company has established its plant at Oshkosh. The P. & B. Company will continue to make its regular line of outlet boxes, connectors, etc., at Milwaukee.

Approval for Electrical Safety Cap Lamps.—In the ELECTRICAL WORLD of July 22, 1916, page 202, was given a list of portable electric mine lamps. The Concordia Safety Lamp Company, Fulton Building, Pittsburgh, Pa., announces that besides the approval No. 12 which was granted to it for its electric safety hand lamp mentioned in the issue referred to above, it has received approval No. 15 from the United States Bureau of Mines for its electric safety cap lamp.

The Emerson Electric Manufacturing Company, St. Louis, Mo., is contemplating building a seven-story building at a cost of approximately $300,000 which will adjoin its plants at Twenty-first Street and Washington Avenue. As soon as the new building is completed the company will occupy the entire block between Twentieth Street and Twenty-first Street, and Charles Street and Washington Avenue, except the corner at Twentieth and Washington Avenues, which is occupied by a fire-engine house.

More Heroult Furnaces.—In the past six months the United States Steel Corporation has granted licenses for a total of twenty-eight Heroult electric furnaces for steel making in this country and Canada, which exceeds by four the number licensed during the full year of 1915. At present a total of seventy-two Heroult units are either in operation, in the course of building or have been authorized in the United States and Canada. Arrangements for a large number of additional furnaces have been made by various companies through licenses from the Steel corporation during the past several weeks.

Commercial Attaché Desires Catalogs and Printed Material.—The commercial attaché of the American Embassy in Paris advises us that he is very desirous of receiving catalogs, price-lists and similar printed material from American electrical concerns interested in the French and Spanish markets. The embassy receives numerous inquiries almost every day for the names and addresses of American firms capable of furnishing a large variety of products and the attaché says that it is much more helpful to be able to exhibit catalogs to such inquirers than to be reduced to the simple expedient of giving them names and addresses of American firms in the lines covered by these inquiries. The literature should be addressed to 36 Avenue de l'Opera, Paris, France.

New Incorporation of X-Ray Manufacturers.—The sale of the properties and interests of the Victor Electric Company of Chicago and New York, the Scheidel-Western X-Ray Company, Chicago and New York, the Macalaster-Wiggin Company of Cambridge, Mass., Chicago and New York, and the Snook-Roentgen Manufacturing Company of Philadelphia and New York, to the Victor Electric Corporation has been consummated. The new corporation has an authorized capital of $2,500,000. It is believed that the exchange of experience, ideas, skill and processes, and the development of co-operative spirit and mutual service through this consolidation, will make it possible to serve the trade more acceptably, improve the quality of the various products and minimize waste. The individuality of the several companies will be continued and goods will be billed in the names of the separate concerns, so that any particular article produced by any individual factory may still be had.

American International Corporation Forms Special South American Company.—So many propositions of a diversified nature have been presented to the American International Corporation which merit careful investigation that it has been found necessary to provide a special organization to investigate and handle the business arising from Latin-America through the formation, under the laws of Maine, of a subsidiary corporation to be known as The Latin-American Corporation with an authorized capital of $1,000,000. Charles A. Stone, president of the American International Corporation, is to be president of the new company; R. P. Tinsley, treasurer of the American International Corporation, is to be treasurer, and its directors as so far announced are, besides the officers, W. S. Kies, P. W. Henry and Thomas W. Streeter. The organization will include an expert engineering and construction staff, and will be equipped not only for construction but for the operation of acquired properties.

Foreign Trade Opportunities. — According to inquiries made of the Philadelphia Commercial Museum the following electrical apparatus and materials allied therewith are desired in foreign countries: Vacuum cleaners, Saratov, Russia; meters, Manchuria, China; wire, Lisbon, Portugal; electric furnaces, electric traction plows, steel plate for electrical apparatus, copper, electric cranes and hoisting equipment, Milan, Italy; electric light apparatus, Piura, Peru; machines for insulating copper wire, San Luis Potosi, Mexico; copper and tungsten, Rio de Janeiro, Brazil; gas-filled tungsten lamps, galvanized iron wire and brass wire, Barcelona, Spain. American manufacturers of gas-filled lamps, it is stated, should find it especially advantageous to establish commercial relations in Barcelona since the German firms formerly supplying that territory have not been able to meet the demand. Other trade opportunities are offered in Newfoundland, where import duty has been raised on electrical and allied supplies for the Union Electric Light & Power Company which was incorporated recently to supply energy for motive power for electric railways in Trinity, Catalina, Bonavista, etc.

H. W. Beers, who is president and manager of the H. W. Beers Electric Company, dealer in electrical machinery and supplies in Mexico City, and also general manager of the Mexican Electrical Heating Appliance Company, is now at Tuxhaven, Arcadia, Fla., where he is visiting friends until the present trouble in Mexico will be sufficiently settled so that he can return. Mr. Beers left Mexico City via Vera Cruz to Tampa on the U. S. Transport Sumner, which docked on July 8. When he returns to Mexico City he is figuring on taking some electrical goods back with him, especially electrical irons and cooking devices and would like to get in touch with firms making this kind of goods. Owing to the stringency of financial conditions in Mexico at the present time, Mr. Beers prefers to communicate with manufacturers of low-priced appliances. There is an unusual demand for electric cooking appliances at the present time, Mr. Beers asserts, owing to the high price of fuel and to the fact that the light and power companies have not been allowed to raise their rates. Mr. Beers states that the stocks of electrical machinery and supplies were almost entirely exhausted when he left Mexico City, this being especially the case in reference to motors and repair parts. Magnet wire, for instance, was not procurable anywhere, Mr. Beers declared.

Possible Foreign Market for Fittings in Naples.—Electricity is used for lighting purposes by the greater portion of the population of Naples, Italy, and large quantities of lighting fixtures and of other arc and incandescent lamps are annually purchased for use there, it is stated by Consul Jay White. The countries of origin of these goods have been chiefly Austria-Hungary, Germany and France for fixtures, and Austria-Hungary and Germany for lamps. In regard to the class of fixtures used, banks and stores are largely furnished with ceiling lights, while private houses and apartments have drop lights, electroliers, and figures (statuettes). At present there is very little indirect lighting used, but Consul White was of the opinion that there seems to be an opportunity for the introduction of this form of illumination. Letters to business houses in Naples should be in the Italian language. A list of dealers in electric lighting fixtures in Naples can be obtained at the Bureau of Foreign and Domestic Commerce or its district offices by referring to File No. 74781.

St. Louis Electric Company in Quest of Athletic Director.—The Wagner Electric Manufacturing Company, St. Louis, has been advertising in the St. Louis newspapers for an athletic director. The company has found from experience, it is stated, that the best mechanics are athletes and so the board of directors has decided that better play makes for better work and hereafter athletics will be encouraged among the employees. Three thousand of the 3500 employees in the four plants of the company are men and boys. For some time past a considerable number of the men have been playing tennis and baseball, and it has been noted those who excel at play were always those who showed up well in their daily work. The company will employ an experienced athlete, it is reported, who will devote a part of his time to factory work and part to athletics. It will be his duty to organize the workers into teams and prepare schedules for them in all branches of sport that the men may be interested in. The company has a large field north of one of its plants, suitable for all athletic purposes, where a running track and other appurtenances for field sport will be laid out. The athletic director will be expected to instruct the plant workers in hygiene and the care of the body and supervise the training of men for strenuous events that they may take part in. The company already maintains a clinic and its employees daily may consult its doctors about their health. The medical department will co-operate with the athletic department toward developing the best that is in the employees. "It is our desire," President Layman remarked, "to display a helpful but not patronizing interest in our employees. We have manifested interest in them in other ways. We have the Wagner Electric Aid Association, conducted by the employees, and any aid distributed by it to members is duplicated by the company. The aid association publishes a paper called the *Wagner Electric Aid Journal*, which prints the news of the plants, telling of work and play. The athletics will be conducted by the employees in connection with their aid society."

NEW YORK METAL MARKET PRICES

	July 25 Selling Prices Bid	Asked	Aug. 1 Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	98 0 0		109 0 0	
Prime Lake	25.00 to 25.50†		25.25 to 25.75†	
Electrolytic	25.50 to 26.00†		26.50 to 26.75†	
Casting	23.50 to 24.00†		24.25 to 24.50†	
Copper wire	31.00†		31.00†	
Lead	6.50		6.50	
Nickel	45.00 to 50.00		45.00 to 50.00	
Sheet zinc, f.o.b. smelter	15.00†		15.00†	
Spelter	10.42½		9.17½ to 9.42½	
Tin, straits	38.00		38.25	
Aluminum, 98 to 99 per cent.	57.00 to 59.00†		56.00 to 58.00†	

OLD METALS

Heavy copper and wire	19.50 to 20.00†	19.00 to 20.00†
Brass, heavy	12.25 to 12.50†	12.00 to 12.50†
Brass, light	10.00 to 10.25†	9.00 to 9.50†
Lead, heavy	5.50 to 5.62½†	5.00 to 5.25†
Zinc, scrap	7.00 to 7.50†	7.50 to 7.75†

COPPER EXPORTS

Total tons for July	35,048

†Nominal.

Corporate and Financial

Cleveland (Ohio) Electric Illuminating Company.—For the twelve months ended June 30 the company's earnings showed large increases over the previous year. Operating expenses and taxes, however, increased 13.8 per cent and depreciation increased by 31.95 per cent, causing the balance applicable to common stock dividend to be less than during the preceding twelve-month period by $84,582.73. The condensed statement of earnings follows:

	1916.	1915.
Gross earnings	$4,649,339	$4,281,273
Operating expenses and taxes	2,506,377	2,202,470
Income over operating expenses and taxes	$2,142,961	$2,078,803
Interest charges, preferred stock dividend and amortization of bond discount	432,134	420,198
	$1,710,827	$1,658,605
Depreciation	564,933	428,128
Applicable to common stock dividend	$1,145,894	$1,230,477

International Power Company of New Jersey.—A proposition for the reorganization of the company now in the hands of a receiver has been filed with Chancellor Walker at Trenton, N. J. The hearing has been deferred until Aug. 15. The reorganization proposition provides for the raising of $20,000 for the payment of receivership expenses, discharge of the receiver, reorganization of the company under the liberal Virginia laws and dissolution of the New Jersey corporation.

Massillon Electric Plans Bond Issue.—The Massillon (Ohio) Electric & Gas Company has asked the State Utilities Commission for permission to create a $2,000,000 bond issue and to sell $600,000 par value of these bonds and $125,000 par value of its preferred capital stock to pay off outstanding obligations and to reimburse the treasury for improvements made during the past year.

Northern Iowa Gas & Electric Company.—The company has just purchased the central station plants at Emmetsburg and Spirit Lake, Iowa, including transmission lines to Orleans, Arnold Park and Milford, formerly owned by the Northwest Iowa Electric Company.

Standard Gas & Electric Company, Chicago, Ill.—A block of $250,000 of 6 per cent gold notes due Oct. 1, 1935, is being offered at 95 and interest to net 6.45 per cent.

Washington (D. C.) Railway & Electric Company.—In the annual report for 1915 Clarence P. King, president of the company, states: "The management looks back over 1915 with something more than the usual feeling of satisfaction. During a year marked by universal industrial depression our company has forged ahead, and the figures for 1915 present an interesting exhibit. It is evident that the explanation offered a year ago for a gratifying increase during the lean year of 1914 was based upon a substantial fact, viz.: "The unique position enjoyed by the national capital. With a federal budget larger than ever by $24,000,000, with official personnel materially augmented during the year, and with the population of the District increased by approximately 5000, one could scarcely anticipate retrogression, even in the face of hard times largely superinduced by conditions arising from the European war; on the contrary, it suggests a deep underlying strength for all of the activities of the capital." A summary of the results from the operation of all companies for the year 1915, after excluding all offsetting transactions, is as follows:

	1915
Gross earnings from operation	$5,191,627
Miscellaneous income	22,328
Gross income	$5,213,955
Operating expenses (including taxes and depreciation)	3,009,072
Gross income less operating expenses	$2,204,883
Fixed charges	1,187,997
Surplus income	$1,016,886
Surplus income:	
Dividend on preferred stock	425,000
Dividend on common stock	455,000
	$136,886
Profit sharing	$15,527
Sinking fund requirements—Potomac Electric Power Company	105,400
Miscellaneous items—net credit	6,958
Credited to profit and loss	$22,917

New Utility and Industrial Companies

The Lorimor (Iowa) Light & Power Company has been incorporated with a capital stock of $15,000 by J. F. Smith, E. L. Booth and others.

The Stithton (Ky.) Electric Company has been incorporated with a capital stock of $3,000 by L. J. Metcalfe, C. H. Aubrey and John Fisher.

The Blockton (Iowa) Light & Power Company has been chartered with a capital stock of $10,000 by J. R. Eyre, Edwin L. Booth and others.

The Manor Electric Company of Pittsburgh, Pa., has been granted a charter with a capital stock of $5,000. J. W. Miller of Pittsburgh, Pa., is treasurer.

The Westmoreland Electric Company of Pittsburgh, Pa., has been granted a charter with a capital of $5,000. J. W. Miller of Pittsburgh, Pa., is treasurer.

The Woodlawn Light & Power Company of Pittsburgh, Pa., has been incorporated with a capital stock of $5,000. J. W. Miller of Pittsburgh, Pa., is treasurer.

The Stimple & Ward Company of Pittsburgh, Pa., has been incorporated with a capital stock of $30,000 to manufacture electrical machinery. John C. L. Ward is among the incorporators.

The Bowmansville Electric Company of New Holland, Pa., has been chartered with a capital stock of $5,000 to operate in Brecknock Township. S. R. Rothermel of Reading is interested in the company.

The Miller-Church Electrical Company of Stamford, Conn., has been organized with a capital stock of $2,000 to conduct a general electrical business. The incorporators are: Albert A. Miller, William D. Church and E. A. Miller, all of Stamford.

The Moore Steam Turbine Corporation of Wellsville, N. Y., has been incorporated by J. L. Moore, J. B. Laird and E. D. Spicer of Wellsville. The company is capitalized at $160,000 and proposes to manufacture steam engines, attachments, mill supplies, etc.

The Monitor Motor Company of New York, N. Y., has been incorporated with a capital stock of $1,000,000 to manufacture motors, engines, machines, etc. The incorporators are: M. Monifried, M. E. Kaplan, 299 Broadway; B. Robins, 999 Freeman Street, New York, N. Y.

The Lincoln County Light & Power Company of Parsons, N. M., has been incorporated with a capital stock of $150,000. The incorporators are: J. H. Fulmer and George H. Feller of Chicago, Ill.; A. T. Graham of South Bend, Ind.; George L. Ulrick of Carrizozo and A. T. Anderson.

Louis Boecher & Sons of Spring Valley, N. Y., has filed articles of incorporation with a capital stock of $35,000 to deal in hardware, cutlery, gas and electric appliances, auto and agricultural equipment. The incorporators are: G. E. Tollner, L. and L. H. Boecher, Jr., of Spring Valley, N. Y.

S. Glickfeld & Son of Newark, N. J., have filed articles of incorporation with a capital stock of $10,000 for the purpose of conducting a general gas, electrical and mechanical engineering business. The incorporators are: Isaac Eisenstadt, George Glickfeld and Samuel Glickfeld of Newark, N. J.

The Feldman Manufacturing Company of New York, N. Y,. has been chartered with a capital stock of $100,000 to manufacture and deal in electric water heaters, patented articles, hardware, etc. The incorporators are: E. Weber, G. E. and T. K. Feldman, 242 West Forty-fifth Street, New York, N. Y.

The Eclipse Light, Heat & Power Company of Oil City, Pa., has been incorporated by John E. Zimmerman, Robert C. Shields and B. Marx, all of Philadelphia, Pa. The company is capitalized at $5,000 and proposes to supply electricity for lamps, heaters and motors in the township of Sugarcreek.

The Ameco Motor & Electric Company of New York, N. Y., has been incorporated by A. Shadur, M. M. Rafkin and F. H. Bang, 217 Cedar Street, New York City. The company is capitalized at $5,000 and proposes to manufacture and deal in motors, sewing machines, dynamos and electrical apparatus.

Trade Publications

Oil Engines.—"Loomis" oil engines are described and illustrated in bulletin No. 501, prepared by the Johnston & Jennings Company, Cleveland, Ohio.

Lighting Fixtures.—The Harter Manufacturing Company, 1132 West Austin Avenue, Chicago, Ill., has prepared an attractively illustrated bulletin which describes its "Nitrolite" fixtures.

Electric Washer.—The "1900" Washer Company, Binghamton, N. Y., has prepared an illustrated folder which contains information on various types of electrically operated "Cataract" washers.

Portable Electric Ranges.—Landers, Frary & Clark, New Britain, Conn., are sending out a new folder printed in colors which contain information on their portable single-type and double-type ranges.

Oil-Filled Cable Joints.—The Metropolitan Engineering Company, 35 Vestry Street, New York, has prepared bulletin section No. 9, which is illustrated and describes oil-filled cable joints for high-voltage cables.

Self-Dumping Underfeed Stokers.—The Sanford Riley Stoker Company, Worcester, Mass., has prepared an attractively illustrated folder which contains information on the Riley self-dumping underfeed stoker.

Valves.—The Nelson Valve Company, Chestnut Hill, Philadelphia, Pa., has issued an illustrated bulletin entitled "Extra Heavy Steel Gate Valves for Superheated Steam and Other Power Plant Service; Outside Screw and Yoke."

Electric Ranges.—The National Electric Utilities Corporation, 103 Park Avenue, New York, is sending out illustrated bulletins which describe its latest "Neuco" electric range, which is provided with oven and broiling compartments.

Electric Appliances.—The Trumbull Electric Manufacturing Company, Plainville, Conn., has published catalogue No. 11, which contains a large amount of information on various "Circle T" products. It is profusely illustrated and is made up of 216 pages.

Refillable Fuses and Soldering Irons.—The Monarch Refillable Fuse Company, Buffalo, N. Y., has prepared an illustrated catalogue which is descriptive of Monarch refillable fuses, refillable plugs, an alternating-current buzzer and electrical soldering irons.

Heaters for Use with Ventilating Systems.—The American Blower Company, Detroit, Mich., has prepared bulletin No. 17, series 3 (superseding No. 17, series 1) and bulletin No. 17, series 4 (superseding No. 17, series 2) on its "ABC" heaters and "ABC" unit heaters respectively, which are designed for use with its ventilating systems.

Reversing Planer-Motors. — "The Economy Produced by Using Reversing Planer-Motors on Machines Having Reciprocating Motion" is the title of descriptive leaflet No. 3554-A just issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The company has also prepared descriptive leaflet No. 3881 on trolley line material including clinch ears, trolley splicers, frogs and suspensions.

Train-Lighting Batteries.—The Edison Storage Battery Company, Orange, N. J., has just issued a bulletin on train-lighting batteries which contains illustrations showing the batteries in actual service as well as the construction of individual cells. The text embraces a thorough description of the manufacture of the cells, their characteristics and battery troubles, and gives special attention to the chemical changes involved in charge and discharge.

Push-Button Press Control, Machine-Tool Controllers and Electrically Heated Candy Manufacturing Appliances.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just prepared a new four-page newspaper-size broadside on the Kohler push-button press control, which, it is stated, is now in use in 80 per cent of the printing establishments of the country. A large two-color eight-page folder describing machine-tool controllers has also recently been published especially for distribution to master car builders at their recent convention. Another new Cutler-Hammer publication is an eight-page booklet descriptive of several types of electrically heated candy manufacturing appliances.

New England

CAMBRIDGE, VT.—The Village Trustees have been authorized to contract with the St. Albans (Vt.) Power & Light Company for lighting the streets of the village with electricity.

SWANTON, VT.—At a town meeting held recently it was voted to develop the power at Highgate Falls to the extent of 1000 hp. The work will include the construction of a new power house at the foot of the rapids where the fall is much greater than at the present plant, which is located near the dam, the installation of a 1000-hp. generating unit, to cost about $55,000; also the construction of a new penstock, at a cost of about $15,000, making the total cost $70,000.

BOSTON, MASS.—Bids will be received at the office of the Park and Recreation Department, 33 Beacon Street, Boston, Mass., until Aug. 11 for grading, underground electric light service and concrete work on Ronan Park, Dorchester. John H. Dillon is chairman.

WORCESTER, MASS.—Preliminary steps have been taken toward securing a new street-lighting system on Summer Street.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company of Providence, it is understood, contemplates erecting a high-tension transmission line through the Pawtuxet Valley to Connecticut.

NEW HAVEN, CONN.—The City Council is considering taking over the ornamental street-lighting system and extending it. The new plans proposed by the United Illuminating Company contemplates surrounding the square bounded by College, State, George and Elm Streets with electric lamps of 4 amp. instead of six amp., at a cost of about $80 per year per standard, making a total of about $8,000. Mayor Rice states that the city must include in its estimates for next year at least $10,000 additional for lighting and that the outskirts of the city must be lighted.

NORWICH, CONN.—Improvements are being made to the municipal electric-light plant, including the installation of two 490-hp. Heine boilers, equipped with stokers manufactured by Schumaker & Santry of Boston, Mass. S. J. Kehoe is manager.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 15 for furnishing at the navy yard, Brooklyn, the following supplies: Electrical cable and wire, bibb cocks, cutting compound, air compressors, railroad crossings, hardware, etc. Copies of proposal blanks may be obtained on application to the above bureau or to the supply officer, navy yard, Brooklyn.

COBLESKILL, N. Y.—Bids will be received by D. D. Frisbie, president of board of trustees, of the Schoharie State School of Agriculture, Agricultural Hall, State and Lodge Streets, Albany, until Aug. 15 for construction of dairy and horse barn, including plumbing and electric work, at the Schoharie State School of Agriculture. Specifications may be seen at the office of the director, First National Bank Building, Schoharie; New York Office of the Department of Architecture, Room 1224 Woolworth Building, New York City, and at the Department of Architecture, Capitol, Albany.

FALCONER, N. Y.—The Jamestown Lighting & Power Company has applied to the Public Service Commission for permission to take over the local electric-light plant, owned by Fred Sprague. The company has been granted a franchise in Falconer.

LANCASTER, N. Y.—The Public Service Commission has authorized the Depew & Lancaster Light, Power & Conduit Company to issue $72,000 in bonds, the proceeds to be applied toward payment of the $90,000 in extensions and additions to be made to properties of the company in West Seneca and elsewhere.

LYNBROOK, N. Y.—James H. Dayton, president of the village of Lynbrook, is advocating the installation of a municipal electric-light plant.

NEW YORK, N. Y.—Bids will be received until Aug. 7 by the Department of Public Charities, tenth floor, Municipal Building, for furnishing material and labor required for repairs to certain of the down draft boilers in the Metropolitan Hospital power house, Blackwell's Island. Blank forms and further information may be obtained at the office of the purchasing agent of the department, tenth floor, Municipal Building, where plans and specifications may be seen.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

OSWEGO, N. Y.—A special election will be held Aug. 17 to submit to the voters the proposal to issue $345,000 in bonds for the purpose of building a municipal power plant to develop the water power owned by the city at the new high dam. The present plans provide for the development of one-half of the water power, about 7500 hp., but provision will be made for the development of the remainder.

POTSDAM, N. Y.—The St. Lawrence Transmission Company of Potsdam is securing the right of way for an electric transmission line from Pyrites to Heuvelton; from the latter place an extension is being erected to Morristown. The extension from Heuvelton to Morristown will be erected by the Gregory Electric Company of Morristown, which has a contract with the St. Lawrence Company for Hannawa power.

SILVER CREEK, N. Y.—The Public Service Commission has authorized the Silver Creek Electric Company to issue $7,000 in bonds, to be sold at not less than 80, the proceeds to be used for payment of street-lighting system in Silver Creek. The total cost of the street-lighting system as detailed by the company is $7,008.

ALLENTOWN, PA.—The Lehigh Valley Light & Power Company of Allentown contemplates installing a street-lighting system at Northampton Heights.

HAUTO, PA.—The Lehigh Coal & Navigation Company, it is reported, is contemplating extensive improvements and extensions to its Harwood plant.

SHILLINGTON, PA.—The Public Service Electric Company has granted the Berkshire Electric Company of Wernersville permission to install and operate electric systems in Shillington and Sinking Spring.

WAYNE, PA.—Plans are being considered by the borough improvement committee for the installation of a new street-lighting system.

CAMDEN, N. J.—The Victor Talking Machine Company has applied for permission to lay additional railroad tracks across Delaware Avenue and to construct an underground conduit system for electric wires and cables from the power plant to Delaware River.

CAPE MAY, N. J.—The power plant of the Cape May, Delaware Bay & Sewell's Railroad Company was recently destroyed by fire. N. Z. Graves, 22 South Third Street, Philadelphia, Pa., is president.

FREEHOLD, N. J.—The Board of Public Utility Commissioners has granted the Monmouth Lighting Company of Freehold permission to issue $26,500 in bonds, for additions and improvements to its plant.

HARRISON, N. J.—The installation of a new street-lighting system (flaming arcs) on Harrison Avenue is being considered by the City Council.

LAMBERTVILLE, N. J.—Improvements to the plant and equipment of the Lambertville Public Service Company, involving an expenditure of $25,000 prior to the issuance of $170,000 in bonds for extensive additions to the generating system, has been recommended by the Board of Public Utility Commissioners.

NEWARK, N. J.—The Public Service Electric Company is planning to install new street lamps on Belleville Avenue from Broad Street to Bloomfield Avenue.

TRENTON, N. J.—The Civics Association, Washington's Crossing, is negotiating for the installation of an electric system for street and residence service.

TRENTON, N. J.—The City Commission has approved final plans for the installation of a new street-lighting system in the downtown section to consist of 306 lamps of 600 cp. each, mounted on ornamental poles. The Public Service Electric Company will make the installation.

DENTON, MD.—The Eastern Shore Gas & Electric Company of Salisbury has petitioned the Public Service Commission for permission to acquire the capital stock of the Peninsula Light & Power Company at Denton.

MARTINSBURG, W. VA.—The property and holdings of the Martinsburg Power Company, which were purchased by Emory L. Coblentz, representing the reorganization committee, will be reorganized under the name of the Potomac Light & Power Company. The plans for reorganization include an expenditure of $100,000 for necessary improvements. The property includes two dams on Potomac River, power house, electrical transmission system to Martinsburg and Shepherdstown, etc.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 9 for furnishing under proposal No. 829 25,000 ft. anrenna wire, seven strand. For further information address Charles S. Wallace, captain signal corps, U. S. Army.

WASHINGTON, D. C.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Aug. 28 for supplying to the various federal buildings, marine hospitals and quarantine stations under the control of the Treasury Department portable lamps during the fiscal year ending June 30, 1917. For details see proposal columns.

WASHINGTON, D. C.—Plans have been prepared by R. B. Redington of A. M. Schneider & Company, 1430 K Street, N. W., Washington, D. C., for building to be occupied by Department of Justice, to cost $300,000. The proposed building will be 145 ft. by 148 ft., eight stories high. Machine rooms in the basement; three electric elevators; vacuum cleaning system; central telegraph and telephone stations on sixth floor.

WASHINGTON, D. C.—Bids will be received at the office of the secretary of the Board of the Commissioners of District of Columbia, room 59, District Building, Washington, D. C., until Aug. 10 for furnishing and installing lighting fixtures in the Dunbar High School Building, No. 174, located at First and N Streets, Northwest. Blank forms of proposal, specifications, etc., may be obtained of the chief clerk, Engineer Department, room 427, District Building, Washington.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Boston, Mass., Schedule 9948—eight water heaters. Brooklyn, N. Y., Schedule 9950—430 after range motor boat lamps; Schedule 9945—25,000 chemical sound tubes; Schedule 9958—40 ½-in. electric portable drills; Schedule 9966—miscellaneous interior communication cables, 270,000 ft. double conductor, 600,000 ft. bell wire, 335,000 ft. double-conductor wire, miscellaneous single-conductor wire, miscellaneous twin conductor wire; Schedule 9952—90,000 ft. telephone cord; Schedule 9946—65 fans, alternating current, 110 volts, 12 and 16 in.; Schedule 9965—49,000 ft. rubber-covered wire. Philadelphia, Pa., Schedule, 9952—miscellaneous brass wire. Norfolk, Va., Schedule 9943—205 watertight vibrating bells and buzzers; Schedule 9946—10,000 ½ by 12-in. arc lamp carbons. Applications for proposal blanks should designate the schedule desired by number.

North Central

BATTLE CREEK, MICH.—Work has begun on the construction of the new power plant for the Postum Cereal Company in Battle Creek. The cost is estimated at $60,000.

DETROIT, MICH.—Plans have been prepared by Smith, Hinchman & Grylls, architects, Washington Arcade, Detroit, for the erection of a nine-story building for the Detroit Edison Company at Second and Elizabeth Streets, to cost about $250,000. work will not begin on construction of the building until next year.

GRAND RAPIDS, MICH.—The installation of ornamental electric lamps on Division Avenue, between Goodrich and Wealthy Streets, is under consideration.

AKRON, OHIO.—The Public Utilities Commission has authorized the Northern Ohio Traction & Light Company of Akron to issue $14,075,000 in bonds. Of the proceeds $12,000,000 will be used to retire outstanding bonds and the remainder for improvements, which include $387,000 for double tracking between Falls and Bedford, $160,000 from Bedford to Newburg Hamlet, $275,000 from Canton to Massillon, $12,000 for extensions of tracks in Akron, $175,000 for double tracking the Canton-Akron line from Blue Pond to Springfield Lake, $340,000 for double track in Akron, $280,000 for high-tension line near terminal at Akron and $35,000 for extension of the Mahoning line in Canton to the factory district.

NEW PHILADELPHIA, OHIO — Bids will be received until Aug. 15 at the office of James E. Scott, director of public service, New Philadelphia, Ohio, for one 200-hp. water tube boiler.

QUINCY, OHIO—The installation of an electric-lighting system in Quincy is under consideration.

RAVENNA, OHIO—Bids will be received at the office of Director of Public Service, Ravenna, Ohio, until Aug. 18 for construction of concrete and brick pumping station at Breakneck Creek and a small diversion dam, etc.; also for furnishing and installing complete on the foundations in the proposed pumping station one 3,000,000-gal., horizontal, motor-driven centrifugal pumping unit, a 2300-volt transmission line about 2 miles long, switchboard and other appurtenances. Copies of plans, proposal forms, etc., can be obtained at the above office and at the office of R. Winthrop Pratt, Hippodrome Building, Cleveland, Ohio, consulting engineer, upon deposit of $10. W. H. Linton is director of public service.

SOUTH ZANESVILLE, OHIO—The Ohio Electric Railway Company of Zanesville has been awarded the contract for street-lighting in South Zanesville, under the terms of which the company is to furnish 28 lamps of 100 cp. and four lamps of 250 cp.

TIFFIN, OHIO—The Ohio Light & Power Company is preparing to secure the right of way for the proposed Tiffin-Shelby transmission line which the company has contracted to erect by Jan. 1, 1917. The transmission line has been completed to the Dolomite Products Company's plant at Maple Grove. Franchises have been secured by the company in Bettsville and Burgoon and preparations are being made to enter those towns.

COVINGTON, KY.—Bids will be received by the Covington Building Commission until Aug. 17 for the erection of an addition to the Booth Memorial Hospital as follows: (1) Excavations, concrete work, etc.; (2) brick masonry; (3) iron work; (4) carpenter work, etc.; (5) roofing and metal work, etc.; (6) steel windows; (7) painting; (8) plastering; (10) tiling and marble work; (11) plumbing, gas piping, etc.; (12) electric work; (13) hot-water heating and steam plant; (14) electric elevator and food lift; (15) linoleum floor coverings; (16) kitchen equipment; (17) refrigerating equipment. Bids will be received for the entire work or separately. Plans and specifications may be seen at the Builders & Traders Exchange, Cincinnati, Ohio, and at the office of Bernard T. Wisenall, architect, First National Bank Building, Cincinnati, Ohio.

WINCHESTER, KY.—George E. Tomlinson of Winchester, it is reported, is contemplating the purchase of a 100-kw., 60-cycle, 220-volt, alternating current, 600 r.p.m. generator (belted) and 20 motors of from 3 to 30 hp.

DAYTON, IND.—The Mulberry Light & Power Company, recently organized, has applied to the County Commissioners for a franchise to erect a transmission line along the Jackson highway from Mulberry to Dayton.

EVANSVILLE, IND.—Work has started on improvements to the electrical department of the Evansville Public Service Company, which will include the installation of a new switchboard, to cost about $100,000. The cost of the entire work is estimated at about $140,000.

DUNNING, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, Ill., until Aug. 15 for construction of kitchen, bakery and dining room building at the Chicago State Hospital, Dunning, Ill. Separate bids to be submitted on general work, heating, plumbing and electric wiring. Plans and specifications may be obtained upon application to James B. Dibelka, state architect, 130 North Fifth Avenue, Chicago, upon deposit of $10.

HEBRON, ILL.—The L. E. Myers Company has notified the Village Board that it is ready to accept the franchise as passed by the board. Arrangements will be made by the company to extend its electric transmission lines to Hebron at once.

JERSEYVILLE, ILL.—The contract for installing the new ornamental lighting system has been awarded to the Central Illinois Public Service Company.

NEWTON, ILL.—Plans are being considered by the City Council for rebuilding the electric-light plant and water-works system, including the purchase of a new site. An ordinance providing for a levy, not to exceed $15,000, for that purpose has been approved by the Council.

SPRINGFIELD, ILL.—The installation of an ornamental lighting system on Capitol Avenue is under consideration.

MILWAUKEE, WIS.—F. G. Simmons, Commissioner of Public Works, has asked the Public Debt Commission to sell $400,000 additional municipal lighting bonds which, in his opinion, is all of the authorized issue of $750,000 that can be used this year for the construction of the municipal street-light distribution system. The commission has already sold $40,000 of the bonds. According to Commissioner Simmons advertisements for material in connection with the construction of the street-lighting distribution system will soon be published.

EMMONS, MINN.—The installation of a municipal electric-light plant is under consideration. Earle D. Jackson, Capital Bank Building, St. Paul, Minn., is consulting engineer.

KARLSTAD, MINN.—An election will be called to submit to the voters the proposal to issue $6,000 in bonds for the installation of an electric-light and power plant.

MIDDLE RIVER, MINN.—The Village Council has granted Petersen & Loveid a franchise to install an electric-light plant in Middle River.

ST. CLOUD, MINN.—The City Commission is considering the installation of an ornamental lighting system extending across the St. Germain Street bridge.

KINGSLEY, IOWA—The Iowa Light, Heat & Power Company has been granted a franchise to construct and operate an electric-light and power system in Kingsley.

LAKE MILLS, IOWA.—The local electric-light plant, owned by J. B. Conley, has been sold to H. Merrifield, who will take possession Sept. 1. The plant will be remodeled and the system changed from direct to alternating current.

MUSCATINE, IOWA—The Muscatine Lighting Company is contemplating the rebuilding of the distribution system (partial) and the installation of one 500-hp. boiler, equipped with Taylor stokers, and one 400-kw. steam turbine. F. S. Dewey is general superintendent.

ORIENT, IOWA.—The town of Orient has entered into a contract with the Creston (Iowa) Mutual Electric Light, Heat & Power Company for furnishing electricity for the proposed municipal electric-lighting system. Under the terms of the contract the town of Orient is to erect the transmission line to a point eight miles outside the town and the Creston company is to start at this point and connect with it, making approximately 5 miles the company will build. The company will install the street lamps and also do the other work necessary within the corporate limits of the town under contract.

WAVERLY, IOWA—Improvements are being made to the municipal electric distribution system for which wire and conductors will be required. H. R. Van Duveer is city clerk.

ALTENBURG, MO.—An electric-light plant, to cost about $5,000, will be installed by Theodore Mueller. Contracts for equipment have been placed.

KANSAS CITY, MO.—Plans are being considered by the Park Commissioners for the installation of an electric-lighting system in Swope Park.

LEBANON, MO.—At an election to be held Aug. 8 the proposal to issue $8,000 in bonds for the construction of a combined electric-light plant and water-works system will be submitted to the voters.

LINN CREEK, MO.—The Nianguа-Osage Junction Mining Company, recently incorporated with a capital stock of $100,000, proposes to develop 640 acres of lead and zinc property. Electrically operated hoists, motor-driven air compressors, air drills, crushers, rolls, pumps, etc., will be installed. Guy R. Stanton of Lebanon, Mo., is vice-president and manager.

ST. LOUIS, MO.—The Board of Estimate and Apportionment has appropriated $12,500 for a survey of the electrical situation in St. Louis to determine the feasibility of building a municipal lighting plant.

ST. LOUIS, MO.—A seven-story building will be erected, at a cost of approximately $300,000, for the Emerson Electric Company, adjoining its building at Twenty-first Street and Washington Avenue. The Emerson company will occupy both the old and new buildings.

RAVINIA, S. D.—Preparations, it is reported, are being made to furnish electrical service in Ravinia not later than Sept. 1. Energy will be secured from a plant in a nearby town.

DIXON, NEB.—The installation of an electric-lighting system is under consideration by the town of Dixon. B. J. Flaherty is clerk.

CONCORDIA, KAN.—The Concordia Electric Light Company has petitioned the Public Utilities Commission for permission to issue $15,000 in capital stock.

DIGHTON, KAN.—The contract for construction of the municipal electric-light plant and water-works system has been awarded to Everett & Burt of Hutchinson, at $24,500.

HOXIE, KAN.—The City Council has engaged George P. Taylor of Stockton, engineer, to take charge of the construction of the proposed municipal electric-light plant. The cost is estimated at $14,000.

JENNINGS, KAN.—At an election held recently the proposal to issue bonds for the construction of a municipal electric-light plant was carried.

McCRACKEN, KAN.—We are informed that the city of McCracken does not contemplate the construction of an electric-light plant at present. An item published in the issue of July 8 stated that the City Council was considering the installation of a municipal plant.

STOCKTON, KAN.—Improvements are contemplated to the municipal electric-light plant. George P. Taylor of Stockton, engineer, has been engaged to take charge of the work.

Southern States

LA GRANGE, N. C.—At an election to be held Aug. 7 the proposal to issue $40,000 in bonds for an electric-light plant, water works and sewer system will be submitted to the voters.

BAINBRIDGE, GA.—A 750-gal, centrifugal motor driven pump is being installed in the municipal electric-light plant. E. N. Edwards is superintendent.

LEESBURG, FLA.—The Leesburg Ice Company, which operates the local electric-light plant, has recently installed a 30-ton York exhaust steam ice machine and has built cork lined cement cold storage rooms. J. Y. Clark is president.

PLANT CITY, FLA.—The Tampa & Eastern Traction Company is reported to have awarded contract for construction of a steam-driven power plant in Plant City and Seffner. E. J. Binford of Tampa is vice-president.

TAMPA, FLA.—The Florida Beach Development Company is contemplating installing electric lamps at Haven Beach on the Gulf at Indian Rocks.

KNOXVILLE, TENN.—The installation of new pumps at the municipal water-works pumping station has been recommended by the water commissioner.

MEMPHIS, TENN.—The Kelsey Wheel Company of Memphis is planning to erect two buildings at its plant in North Memphis. One 60 ft. by 300 ft. for the manufacture of automobile wheels compiete with hubs and steel tires, and the other a power house, equipped with a 500-kw. generator. Alber E. Mehannah is general manager.

FAIRHOPE, ALA.—The installation of a municipal electric-light plant in Fairhope is under consideration.

OPELIKA, ALA.—Arrangements have been made by the Alabama Power Company of Birmingham to supply electricity in Opelika. Transmission lines will be erected from Alexander City to Opelika.

CALHOUN CITY, MISS.—The installation of a municipal electric-light plant and water-works system is reported to be under consideration.

PARAGOULD, ARK.—The Marwell Electric Light and Power Company contemplates the construction of an electric plant (to cost about $15,000) to supply electricity in Marmaduke, Ark., and Cardwell, Mo. A. Bertig is manager, and R. M. Mathis of Cardwell, engineer.

PORTLAND, ARK.—A franchise has been granted to B. O. Cummings to install and operate an electric-light plant in Portland.

CROWLEY, LA.—The Board of Aldermen has authorized the sale of $40,000 in bonds, the proceeds to be used for improvements to the municipal electric-light and water plants.

MIAMI, OKLA.—Bonds to the amount of $25,000 have been authorized for the installation of an electric-light plant and water-works system.

HASKELL, TEX.—The Haskell Ice & Light Company has recently completed the extension of its transmission lines to Knox City, Goree and Mundy, and will make further extensions with a view of reaching all towns within a radius of about 100 miles.

Pacific States

CHEHALIS, WASH.—The Packwood Lake power project, located in the eastern and southern extremity of Lewis County in the Cascade Mountains, owned by the Valley Development Company of Portland, Ore., it is reported, is to be developed. Eighteen water right locations have recently been filed in the office of the auditor of Lewis County. It is estimated that 100,000 hp. can be developed. Extensive surveys were made at the site by the company about 11 years ago.

NORTH YAKIMA, WASH.—The Pacific Power & Light Company is planning to extend its service to the Buena District across the Yakima River from Wapato. This extension will include Springdale and Orchardale districts. Changes are also contemplated in the Wapato service; a proposal will be made to the Council of Wapato offering an improvement to the street-lighting system at slight additional cost.

PE ELL, WASH.—A petition has been presented to the City Council asking that the street-lighting service be restored. The Central Light & Manufacturing Company of Pe Ell will be asked to submit a proposal for lighting the streets.

SPOKANE, WASH.—The Admiral Mining Company of Spokane, it is reported, is contemplating the construction of an electric power plant on Deer Creek, to cost about $5,000. E. Tappan Tannatt is engineer.

BAKER, ORE.—The Council is considering the installation of an ornamental street-lighting system. A fund of more than $1,000 has been raised to date to pay for the system.

CEDARVILLE, CAL.—The Surprise Valley Electric Light & Power Company of Cedarville contemplates the purchase of twenty 5 and 10-amp. meters.

LAGUNA BEACH, CAL.—An election will be held Aug. 22 to submit to the voters the proposal to establish a highway lighting district.

LOS ANGELES, CAL.—Preliminary surveys are being made by the Pacific Light & Power Corporation for the proposed extensive improvements to be made to its hydroelectric plant near Huntington Lake in the high Sierras, to consist of the raising of two concrete dams about 50 ft. and one about 120 ft., installation of additional generating units, etc. R. C. Starr is hydraulic engineer.

OCEANSIDE, CAL. — The Oceanside Electric & Gas Company is erecting a 66,000-volt transmission line from Del Mar to Oceanside. When completed energy for the local system will be obtained from the San Diego steam plant, the Oceanside plant being used for reserve purposes. L. M Klauber of San Diego is superintendent of the electrical department.

RICHMOND, CAL.—The Western States Gas & Electric Company has closed a contract with the Standard Oil Company of California to furnish electricity at the Point Richmond refinery. The contract calls for 1500 kw. The steam plant will be closed down.

SAN FRANCISCO, CAL.—Bids will be received by the Board of Public Works, San Francisco, until Aug. 9 for hydraulic machinery and equipment for Lower Cherry River power development and also for electric generators and exciters for installation of temporary power plant for use of the Hetch Hetchy water supply project. It is proposed to develop power by diverting water from Cherry River leading through a canal to a point near Early Intake and dropping it through a temporary power plant with a 330-ft. fall into Tuolumne River.

LAVA HOT SPRINGS, IDAHO—The Public Utilities Commission has granted the Utah Power & Light Company a certificate of convenience and necessity to supply electricity in the town of Lava Hot Springs.

McCAMMON, IDAHO—The Board of Public Utilities Commission has approved the franchise given by the village of McCammon to the Utah Power & Light Company to furnish electrical service here.

SALT LAKE, UTAH.—Preparations are being made by the Utah Power & Light Company for the construction of a new power plant at Cove on Bear River, about 1½ miles below the company's power house at Grace. The plans provide for the development of 11,000 hp. The company is now erecting an electrically operated pumping station between Mud Lake and Bear Lake (to be known as the Lifton pumping station), so as to augment the work of the Outlet canal. Five electrically-driven pumping units will be installed, having a capacity of 1500 second feet.

DOUGLAS, ARIZ.—The Douglas Traction & Light Company is planning to build a new ice and cold storage plant in Douglas. The proposed plant will have an output of 100 tons daily and will cost about $100,000.

CARTER, MONT.—The Montana Power Company of Butte, it is reported, contemplates extending its service to Carter.

Canada

DRUMHELLER, ALTA.—The Town Council is considering the question of lighting the town with electricity.

CHATHAM, N. B.—The municipal electric-light plant was recently destroyed by fire, causing a loss of about $30,000.

ST. JOHN, N. B.—The City Council has decided to provide a separate power house for the General Public Hospital, at a cost of $30,000.

NORWICH, ONT.—Plans are being considered to place all overhead wires in the city in underground conduits. F. J. Ure of Woodstock is engineer.

OSAQUAN (IGNACE P. O.), ONT.—The Lake Lumber Company is planning to develop a water power on the river at Osaquan. Equipment, including water wheels, etc., will be purchased. F. F. Wilson is mill superintendent.

PORCUPINE, ONT. — The Northern Canada Power Company, it is reported, contemplates installing a 4000-hp. water turbine and generator in its plant at Wawaitin.

RAINY RIVER, ONT.—The Rainy River Electric Light & Power Company has secured a ten-year contract to supply the Canadian Northern Railway with water. The necessary equipment is to be purchased. The company has also obtained a lease of the river front land for five years and will start on construction of a saw mill as soon as the water subsides.

RENFREW, ONT.—The Power Development Committee has recommended that a by-law be prepared providing for raising the sum of $200,000 with which to purchase the first chute water power on the Bonnechere River and to develop it, and also to purchase the fourth chute water power, but not to develop it at present.

SCARBOROUGH, ONT.—The Council of Scarborough Township is negotiating with the Hydro-Electric Power Commission of Ontario with a view of obtaining an electrical service from the city limits along the Kingston Road and up through the township.

TORONTO, ONT.—Preparations are being made for the erection of a four-story addition to the substation of the Toronto Hydro-Electric System, to cost about $90,000.

WATFORD, ONT.—A by-law will soon be submitted to the ratepayers authorizing an appropriation of $10,000 for the installation of a hydroelectric distribution system.

WOBURN, ONT.—A committee has been appointed to negotiate with the Ontario Hydro-Electric Power Commission regarding the proposed extension of the hydroelectric system along Danforth Avenue to Agincourt.

WOODBRIDGE, ONT.—The Woodbridge Hydro-Electric Commission has decided to extend its transmission lines to Maple, a distance of about 5 miles.

SHERBROOKE, QUE.—Plans are being prepared and tenders will soon be asked for the construction of a concrete dam at the municipal hydroelectric plant.

REGINA, SASK.—An investigation is being undertaken by the government of Saskatchewan looking into the possibilities of development in rivers in the northern portion of the province with a view of supplying hydroelectric service to the villages, towns and cities in that district.

PATENTS ISSUED JULY 18, 1916

1,191,426. ELECTRICALLY HEATED UTENSIL; D. C. G. Hughes, Chicago, Ill. App. filed July 8, 1915. Coffee percolator.

1,191,435. PROCESS FOR THE ELECTRIC MELTING OF METALS; C. A. Keller, Paris, France. App. filed Aug. 12, 1902. Casting ladle interposed in electric circuit.

1,191,476. MAGNETO DRIVING CONNECTION; P. Rudolf and J. A. Lund, Batavia, Ill. App. filed March 23, 1914. For producing hot starting spark.

1,191,478. SIGNALING DEVICE; S. T. Runyon, San Francisco, Cal. App. filed Oct. 28, 1914. Magnet operated semaphore arms.

1,191,482. COUPLER FOR ELECTRIC MUSICAL INSTRUMENTS; M. L. Severy and G. B. Sinclair, Arlington Heights, Mass. App. filed July 20, 1912. Simplified electric operated motor coupler.

1,191,495. METHOD FOR SEPARATING NEON FROM GASES WITH WHICH IT IS MIXED; G. Claude, Boulogne-Sur-Seine, France. App. filed June 17, 1913. Electric discharge in neon atmosphere.

1,191,507. ATTACHMENT FOR TELEPHONE MOUTHPIECE; J. A. Hall, San Diego, Cal. App. filed Dec. 10, 1914. Annular antiseptic holder.

1,191,548. CONNECTOR FOR STORAGE BATTERIES; T. A. Willard, Cleveland, Ohio. App. filed May 12, 1915. Tapered engaging parts.

1,191,552. MAKING TUNGSTEN FILAMENTS; E. Aeuer, Berlin, Germany. App. filed Aug. 10, 1910. Heats in atmosphere of ammonia and then decomposes resulting nitrogen compound.

1,191,571. PROTECTIVE DEVICE; E. E. F. Creighton, Schenectady, N. Y. App. filed April 18, 1912. Lightning arrester for D. C. electric railways.

1,191,601. ELECTRICAL HEATER; J. F. Lamb, New Britain, Conn. App. filed May 7, 1915. Grill construction.

Electrical Patents

Notes on United States Patents issued July 25, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York. Included are also notes on a number of patents of date July 18, held over from last week's issue for lack of space.

1,191,602. DEVICE TO PREVENT SKIDDING; J. G. V. Lang, New York, N. Y. App. filed Jan. 20, 1915. Applicable to generative braking systems.

1,191,611. SYSTEM FOR PREVENTING ELECTROLYSIS; W. B. Potter, Schenectady, N. Y. App. filed Feb. 20, 1915. Potential difference between rails and adjacent pipes is minimized.

1,191,619. ELECTRIC CUT-OUT; H. R. Sargent, Schenectady, N. Y. App. filed Jan. 20, 1915. Quickly replaceable fuse.

1,191,620. ELECTRIC SHOT FIRING DEVICE; E. Schietzel, Arma, Kan. App. filed Aug. 13. 1914. For igniting gas from distance point.

1,191,625. CONTROLLING MECHANISM FOR AUTOMOBILES; G. E. Stevens, Lynn, Mass. App. filed Dec. 17, 1914. Motor generator, starting set.

1,191,627. SYSTEM FOR THE PREVENTION OF ELECTROLYSIS; J. B. Taylor, Schenectady, N. Y. App. filed Jan. 4, 1915. Sources of emf. interpolated between sections of conductor.

1,191,641. ELECTRIC LAMP SOCKET; H. H. Willetts, Tetreaultville, Quebec, Canada. App. filed Dec. 30, 1912. Shell separable on longitudinal lines.

1,191,649. CONDUIT BOX ROSETTE FOR ELECTRIC WIRING; A. Barthels, San Francisco, Cal. App. filed Oct. 8, 1915. Locked in place by split ring.

1,191,690. VACUUM LIGHTING ARRESTER; J. T. Greene, Toledo, Ohio. App. filed Dec. 16, 1912. Electrode mounting and sealing features.

1,191,703. ELECTRIC RESISTANCE THERMOMETER; F. Johannsmeyer, Milwaukee, Wis. App. filed Aug. 16, 1912. Minimum resistance to flow of liquid being measured.

1,191,743. ELECTRIC WATER HEATER; M. Simon, St. Louis, Mo. App. filed July 26, 1916. Water may be heated to variable degrees.

1,191,744. PORTABLE LAMP; G. W. Stanton and R. H. Frye, Athens, Tenn. App. filed July 20, 1915. For lighting a clock, or the like.

1,191,759. ELECTRIC CONVERSION; S. Cabot, Brookline, Mass. App. filed Aug. 22, 1912. Polyphase commutation (40 claims).

1,191,783. KEYHOLE ILLUMINATING APPARATUS; P. R. Harsh, Toledo, Ohio. App. filed June 11, 1915. Provision to prevent waste of current.

1,191,796. TROLLEY POLE; O. R. Kirkpatrick, Fort Worth, Tex. App. filed Aug. 26, 1915. Ratchet construction catches pole when trolley leaves wire.

1,191,799. PROCESS OF PRODUCING ALKALI METALS; H. Labhardt, Mannheim, Germany. App. filed Dec. 14, 1914. Passes fresh anhydrous alkali into electrolytic cell.

1,191,812. ELECTRIC LAMP SOCKET CASING; H. J. Morey, Syracuse, N. Y. App. filed April 16, 1914. Multiple lock between shell and cap.

1,191,830. AUTOMOBILE INDICATOR; P. Roussey, Brooklyn, N. Y. App. filed Aug. 7, 1915. Electrically operated hand shows intended movement.

1,191,844. TRANSLATING DEVICE; W. R. Sorgel and W. H. Gaulke, Milwaukee, Wis. App. filed Dec. 18, 1913. For operating percussion hammers, etc.

1,191,856. INTERRUPTER FOR IGNITION DYNAMOS; H. R. Van Deventer, Sumter, S. C. App. filed Oct. 20, 1914. Eliminates platinum contacts.

1,191,914. ELECTRIC WINDING DEVICE FOR CLOCK MOVEMENTS; E. M. Thompson, Beloit, Wis. App. filed Jan. 13, 1914. Features of connection between magnet and spring.

1,191,917. TELEPHONE TRUNKING AND SUPERVISORY SYSTEM; W. L. Campbell, Chicago, Ill. App. filed Feb. 26, 1907. Subscriber can establish connection without aid of operator.

1,191,924. ELECTRIC SWITCH; J. F. Burns, Philadelphia, Pa. App. filed Nov. 10, 1915. Inclosed structure with exposed operating handle.

1,191,933. MEANS FOR SYNCHRONIZING ROTARY DEVICES; G. M. Yorke and G. R. Benjamin, Jersey City, N. J. App. filed Aug. 21, 1915. For synchronous telegraph or signaling systems.

1,191,934. LOCKING MEANS FOR INCANDESCENT LAMPS; H. Altshul, Hartford, Conn. App. filed Dec. 27, 1913. Ratchet contact on end of lamp.

Re. 14,166. STEERING WHEEL; R. H. Scheibert, Cincinnati, Ohio. App. filed June 21, 1915. Push buttons mounted in rim of wheel.

PATENTS ISSUED JULY 25, 1916

1,191,940. GROUND TERMINAL CONNECTION FOR ELECTRIC CONDUCTORS; W. H. Blood, Jr., Wellesley, Mass. App. filed July 9, 1915. For clamping on a pipe.

1,191,973. VEHICLE SIGNALING DEVICE; Hobart S. Johnson, Madison, Wis. App. filed Feb. 17, 1915. Audible on backward movement.

1,191,976. CURRENT INTERRUPTER; Charles F. Kettering, Dayton, Ohio. App. filed June 29, 1910. Gas engine igniter.

1,191,979. TRUCK CONSTRUCTION; William R. McKeen, Omaha, Neb. App. filed May 18, 1909. Details of motor support.

1,192,005. AUTOMATIC MUSICAL INSTRUMENT; Ernest M. Skinner, Boston, Mass. App. filed May 28, 1915. Pipe organ control.

1,192,006. ELECTRIC SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed July 10, 1912. Isolated lighting plants.

1,192,007. TELEPHONE SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed July 24, 1912. To prevent eaves-dropping.

1,192,034. CLAMP OR CONNECTOR; Hugo Brisacher, New York, N. Y. App. filed Jan. 13, 1915. Binding post and socket.

1,192,035. ELECTRIC SWITCH; Hugo Brisacher, New York, N. Y. App. filed Jan. 13, 1915. Knife blade and jaw details.

1,192,050. ELECTRIC FURNACE; Samuel H. Fleming, Cleveland, Ohio. App. filed Jan. 7, 1914. For treating coke and coal.

1,192,051. TROLLEY WHEEL GUARD; George B. Fouts, Alliance, Ohio. App. filed May 5, 1915. Automatic guard and removable wheel.

1,192,052. TROLLEY SWITCH; George B. Fouts, Alliance, Ohio. App. filed July 30, 1915. Automatic two-way switch.

1,192,053. DEVICE FOR REMOVING SNOW AND ICE FROM TROLLEY WIRES; George R. Fouts, Alliance, Ohio. App. filed August 2, 1915. Scraper carried by trolley pole.

1,192,061. PROCESS OF REGENERATING THE WASTE PRODUCTS OF GALVANIC BATTERIES; Wilhelm Hickmann, Frankfort-on-the-Main, Germany. App. filed May 10, 1911. Treatment with chlorine and an oxidizing agent.

1,192,062. PROCESS OF MAKING CARBON ARTICLES; Arthur T. Hinckley, Niagara Falls, N. Y. App. filed Oct. 11, 1912. Adds ammonium sulphate.

1,192,064. SELECTIVE SIGNALING SYSTEM; John A. Huilt, Chicago, Ill. App. filed Oct. 3, 1912. Railway telephone train despatching.

1,192,123. SOUND CONCENTRATING FOR DEVICES FOR AIDING THE HEARING; Eugene W. Schneider, New York, N. Y. App. filed Oct. 15, 1915. Telescopically collapsible.

1,192,126. WIRELESS TELEGRAPH TRANSMITTER; Archibald Shaw, Randwick, near Sydney, New S. Wales, Australia. App. filed June 29, 1912. Jet of gas forced into the gap of the transmitter.

1,192,150. CONNECTOR; Ernest G. Appleton, Chicago, Ill. App. filed Dec. 10, 1914. Outlet box and cable connection.

1,192,153. FLEXIBLE ELECTRIC HEATER; James I. Ayer, Cambridge, Mass. App. filed Aug. 14, 1913. Spirally wound pads.

1,192,165. CALL DISTRIBUTING SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed Oct. 1, 1915. Automatic distribution between idle trunk operators.

1,192,166. DIFFERENTIAL MICHROPHONE REPEATER; John J. Comer, Chicago, Ill. App. filed March 13, 1911. Mechanical details.

1,192,171. CONTROLLING SYSTEM; A. F. Dixon. Newark, N. J. App. filed Jan. 24, 1914. Automatic printing telegraph.

1,192,175. SELECTOR SWITCH; A. H. Dyson, Montclair, N. J. App. filed Aug. 25, 1915. Multiple brush type of patent 1,123,696.

1,192,210. RAILWAY SAFETY SIGNAL SYSTEM; A. S. Keating, Corry, Pa. App. filed Mar. 4, 1911. Automatic cab signals and intercommunication between trains.

1,192,217. DOOR LOCK AND CONTACT FOR ELECTRIC ELEVATORS; H. P. McColl, Melbourne, Victoria, Australia. App. filed Jan. 4, 1915. Interacting latch and circuit control.

1,192,224. CORE FOR USE IN MAKING ELECTRIC STORAGE BATTERY PLATES; G. H. Rabenalt, Buffalo, N. Y. App. filed Nov. 17. 1914. Steel plate with lead coating and paraffine surface.

1,192,235. AUTOMATIC RAILROAD BLOCK SYSTEM; P. J. Simmen, Buffalo, N. Y. App. filed June 3, 1907. For single track and cut-out.

1,192,258. THROTTLE CONTROL; Herbert A. Allen, Willow Creek, Mont. App. filed June 25, 1914. Operated by the chauffeur or from the tonneau.

1,192,264. SAFETY SIGNAL FOR VEHICLES; William N. Best, New York, N. Y. App. filed Sept. 9, 1915. Lights at all four corners.

1,192,268. BRUSH HOLDER; Robert W. Borchard, Milwaukee, Wis. App. filed July 31, 1911. Construction preventing transmission of twisting stresses.

1,192,270. TELEGRAPH KEY; Walter A. Boyd, Brooklyn, N. Y. App. filed July 29, 1914. Semi-automatic.

1,192,312. BURGLAR OR DETECTION SYSTEM; Richard M. Hopkins and Joseph F. Hoge, New York, N. Y. App. filed Dec. 6, 1915. Operated by a delicate telephone transmitter.

1,192,323. RELAY; William Kaisling, Chicago, Ill. App. filed Nov. 16, 1914. Multicontact type for organs.

1,192,346. ELECTRIC SWITCH MECHANISM; Benjamin S. Putts, Erie, Pa. App. filed August 9, 1915. Combination controlled switch for motor-vehicle ignition.

1,192,360. FIELD RHEOSTAT; Henry J. Wiegand, Milwaukee, Wis. App. filed August 22, 1914. Disc regulator type.

1,192,366. STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES; Butler Ames, Lowell, Mass. App. filed Feb. 1, 1915. Spring connected power disc and armature shafts.

1,192,368. AUTOMATIC CIRCUIT BREAKER; Arvid R. Anderson, Columbus, Ohio. App. filed March 22, 1915. Automatic reclosing control.

1,192,389. ELECTRICALLY HEATED IMPLEMENT; Edwin N. Chandler, Braintree, Mass. App. filed Dec. 17, 1914. To interchangeably accommodate various painters' and scrapers' tools.

1,192,393. CURRENT CONVERTING APPARATUS; Lawrence P. Crecelius, Cleveland, Ohio. App. filed June 9, 1912. Compact device with coiling system.

1,192,394. PROCESS OF UTILIZING THE WASTE PRODUCTS OF GARNET WORKS; John Davenport. Brighton, Mass. App. filed Jan. 27, 1915. Electric furnace process for partial reduction.

1,192,397. OIL SWITCH AND FUSE; L. W. Downes and A. W. Faxon, Providence, R. I. App. filed June 25, 1914. Interconnected switch elements and box cover.

1,192,400. ELECTRICAL SYSTEM FOR AUTOMOBILES; T. A. Edison, Llewellyn Park, West Orange, N. J. App. filed May 23, 1912. For starting, lighting, igniting, signaling a gas driven vehicle.

1,192,447. SWITCHBOARD FOR ELECTRIC CIRCUITS; J. J. Nielsen, Chicago, Ill. App. filed May 7, 1915. Composite panel construction.

1,192,453. DEVICE FOR TESTING THE EFFICIENCY OF A SPARK PLUG; J. W. Prasky, Pittsburgh, Pa. App. filed July 15, 1914. Portable device with spark gap.

1,192,457. RESISTANCE WIRE FOR ELECTRIC HEATERS; R. H. Read, Washington, D. C. App. filed July 19, 1910. Encased refractory powder protected wire.

1,192,477. ELECTRICALLY HEATED VESSEL; W. B. Underwood, Rochester, N. Y. App. filed Dec. 14, 1915. Automatic cut-out for sterilizing surgical instruments, etc.

1,192,488. STARTING OF ALTERNATING CURRENT MOTORS; A. Aichele, Baden, Switzerland. App. filed May 7, 1914. Three-phase motor with a starting transformer and choking coils.

1,192,531. MAGNET ACTUATED DEVICE; F. T. Kitchen, West New Brighton, N. Y. App. filed Jan. 21, 1914. For damper, valve, or switch control of furnaces.

1,192,547. METER TESTING CUT-OUT; T. E. Murray, Jr., Brooklyn, N. Y. App. filed Dec. 2, 1915. Shunts the load around the meter.

1,192,566. BLOCK SIGNAL SYSTEM; M. V. Ryder, Northampton, Mass. App. filed June 25, 1908. Train operated trolley switches.

1,192,609. SAFETY SIGNAL FOR BALANCED HOISTS; T. G. Fear, Birmingham, Ala. App. filed Nov. 3, 1915. Controlled from both ends of a mine slope.

1,192,618. MOTOR WITH ROTATING FIELD FOR REPEATING ANGULAR MOVEMENTS AT A DISTANCE OVERCOMING GREAT RESISTANCE; Riccardo Girardelli, Rome, Italy. App. filed Sept. 24, 1910.

1,192,649. ALTERNATING-CURRENT MOTOR; Marius C. A. Latour, Paris, France. App. filed Oct. 28, 1914. For preventing sparking of compensated series motors.

1,192,658. LAMP HOUSE FOR PROJECTING APPARATUS; Elisha E. Maggard, Morehead, Ky. App. filed Dec. 19, 1913. Converging carbon adjustment

1,192,685. ELECTRICAL SIGNALING SYSTEM; William J. Rickets, Brockley, London, Eng. App. filed March 2, 1914. Electromagnetic step-by-step angular movement.

1,192,687. INCLOSED FUSE; Howard R. Sargent, Schenectady, N. Y. App. filed August 22, 1913. Reloadable cartridge type.

1,192,690. INSULATOR SUPPORTING STRUCTURE; William Schaake, Pittsburgh, Pa. App. filed June 5, 1913. Pin and thimble.

1,192,706. X-RAY TUBE; Elihu Thomson, Lynn, Mass. App. filed Sept. 14, 1914. Rotatable target to prevent overheating.

1,192,708. ELECTRICAL REGULATOR; Allen A. Tirrill, Pittsburgh, Pa. App. filed March 3. 1914. Multiple relay motor control.

1,192,709. CRYSTALLINE FUSED ALUMINA AND THE MANUFACTURE THEREOF; Frank J. Tone, Niagara Falls, N. Y. App. filed Dec. 1, 1914. Fuse and electric furnace.

1,192,724. SELECTIVE CUT-OUT FOR ALTERNATING CURRENT CIRCUITS; Paul Ackerman, Toronto, Ont. App. filed Oct. 17, 1912. Automatic selection on reverse flow.

1,192,725. FIRE ALARM; Winnie A. Alcott, Pueblo, Col. App. filed June 15, 1914. Phonograph and telephone combination.

1,192,741. RECTIFIER; Quincy A. Brackett, Pittsburgh, Pa. App. filed April 3, 1914. Vibrating armature type.

1,192,749. AUTOMATIC ELECTRIC LAMP LOCK; Delona L. Calahan, Fairfax, Wash. App. filed Dec. 8, 1915. Concealed by the bulb.

1,192,759. VEHICLE DIRECTION INDICATOR; George A. Denninger, Theresa, Wis. App. filed Nov. 23, 1914. Day and night signal controlled from the driver's seat.

1,192,773. ELECTRIC LOCOMOTIVE; George M. Eaton, Pittsburgh, Pa. App. filed Jan. 7, 1914. Truck arrangement to prevent lateral swing.

1,192,786. ELECTRIC CONTACT DEVICE; Arthur A. Kent, Philadelphia, Pa. App. filed Dec. 10, 1909. Gas engine ignition timer.

1,192,821. ELECTRICAL INSTRUMENT; Frank W. Roller, Orange, N. J. App. filed Nov. 23, 1914. For indicating the operating condition of the storage battery.

1,192,835. ELECTRIC LINE APPARATUS PROTECTOR; Peter K. Higgins, Waco, Tex. App. filed Oct. 22, 1903. Heat cartridge for telephone lines, etc.

14,173 (Reissue). WATERPROOF CAP AND SHELL FOR INCANDESCENT ELECTRIC LAMPS; Clarence A. Vetter, Pittsburgh, Pa. App. filed Feb. 7, 1916. Original patent No. 1,127,326 dated Feb. 2, 1915. Porcelain shell interlocked with socket body.

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Printed in the First Issue of Each Month

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AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Pacific Coast Convention, Seattle, Sept. 5-8.

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ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General Secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Next meeting, Cleveland, Oct. 10-12.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

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ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. L. Blumenthal, 179 West Washington St., Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, C. A. Littlefield, 15th St. and Irving Place, New York. Annual convention, Philadelphia, Sept. 18, 19 and 20.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

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MINNESOTA ELECTRICAL ASSOCIATION. Secretary, F. R. Porter, St. Cloud, Minn.

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NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 19th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, Oct. 10, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual meeting, Pittsfield, Oct. 17-20.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, E. H. LaTourneau, 602 Electric Building, Portland, Ore. Annual convention, Seattle, Wash., September.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

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PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

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SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Eugene Ashe, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis. Next meeting, Waupaca, Wis., Aug. 9-12.